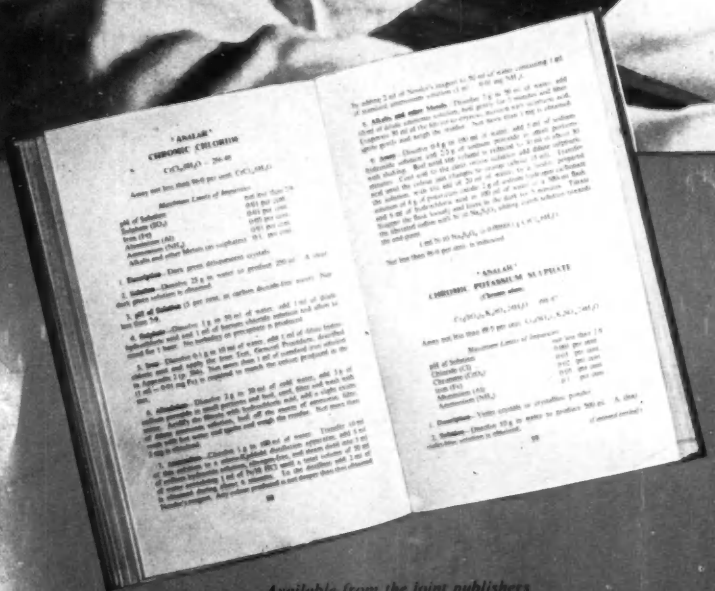
Chemical Age

BCPMA AND FREE TRADE (page 755)

VOL. 78 No. 2000

9 November 1957

the basis of accurate analysis



'ANALAR' STANDARDS FOR LABORATORY CHEMICALS 5th Edition 1957

21s. net.

The 5th Edition of "ANALAR Standards for Laboratory Chemicals", formulated and issued jointly by The British Drug Houses Ltd., and Hopkin & Williams Ltd., is now available.

Outstanding features of the new edition are:—

* Fourteen new reagents are included in the 'ANALAR' range.
* Many improvements have been incorporated in the methods of test for individual items.
* New practices have been adopted for certain tests.
* In general the "Recommended Names for Chemicals used in Industry" of British Standard 2474—1954 has been followed.

Available from the Joint publishers

THE BRITISH DRUG HOUSES LTD., B.D.H. LABORATORY CHEMICALS DIVISION, POOLE, DORSET

HOPKIN & WILLIAMS LTD., FRESHWATER ROAD, CHADWELL HEATH, ESSEX

AMBERLITE
ION EXCHANGE RESINS

What can AMBERLITE Resins Do For Industry?

Here are a few of the successful applications of AMBERLITE ion exchange resins:

Antibiotics are among the pharmaceutical products manufactured with the aid of AMBERLITE resins.

Uranium for atomic energy usage, is extracted by means of AMBERLITE ion exchange resins in many parts of the world. Special types of AMBERLITE resins are used in reactor coolant circuits.

Sugar and glycerol solutions are purified in columns containing AMBERLITE resins.

Metal recovery from plating wastes is being successfully accomplished by using AMBERLITE resins.

Water conditioning by means of AMBERLITE resins provides softened, dealkalized or deionized water for many industrial uses. Water of triple distilled quality is produced by the AMBERLITE Monobed System.

For further information and suggestions, write for a copy of the booklet "Ion Exchange with the Amberlite Resins."

CHARLES LENNIG & CO. (GREAT BRITAIN) LTD.
26-28 BEDFORD ROW
LONDON W.C.I.

Amberlite ***is a registered trade mark of our parent company Rohm & Haas Co. Philadelphia***

OXITOL
high-boiling solvents

The OXITOL trio of mild odoured, high boiling solvents is excellent for finishes based on cellulose esters and many natural and synthetic resins.

OXITOL (*Ethylene Glycol Mono-Ethyl Ether*).

A powerful solvent for nitrocellulose and alkyd resins giving solutions tolerating, in particular, high proportions of aromatic diluents.

OXITOL ACETATE (*Ethylene Glycol Mono-Ethyl Ether Acetate*).

Imparts good flow and enhanced blush resistance to lacquers. Also employed in high temperature stoving systems based on "Epikote", U.F., or P.F. resins.

BUTYL OXITOL (*Ethylene Glycol Mono-Butyl Ether*).

Where a slower evaporating solvent is required, Butyl Oxitol greatly improves blush resistance, flow and gloss of cellulose lacquers as well as the performance of many varnishes and enamels.

OXIRANE LIMITED

An Associate of Shell Chemical Company Limited,
170 PICCADILLY, LONDON, W.1

Enquiries to Divisional Sales Offices
SOUTHERN:
Norman House, Strand, London, W.C.2. Temple Bar 4455

NORTHERN:
144-146 Deansgate, Manchester 3. Deansgate 6451

"OXITOL" *is a Registered Trade Mark*

INDEX TO ADVERTISERS

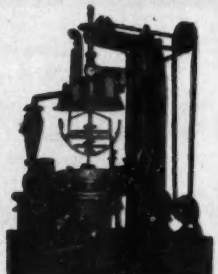
The first figures refer to advertisement in **Chemical Age Year Book,** *the second to the current issue*

Page		Page
229	A.P.V. Co., Ltd., The	—
344	Acalor (1948) Ltd.	—
209	Accrington Brick & Tile Co., Ltd., The	—
176	Adequate Weighers Ltd.	—
	Aero Research Ltd.	—
223	Aimer Products Ltd.	—
159	Albany Engineering Co. Ltd., The	—
	Alexander, Herbert, & Co., Ltd.	—
165	Allen, Edgar, & Co., Ltd.	—
364	Alumina Co., Ltd., The	—
328	Amalgamated Oxides (1939) Ltd.	—
306	Armour & Co., Ltd.	775
G/Cd.	Ashmore, Benson, Pease & Co.	—
189	Ashworth, Arthur, Ltd.	—
	Associated Lead Mfrs. Ltd.	—
G/Cd.	Audley Engineering Co., Ltd.	—
146	Autometric Pumps Ltd.	—
212	B. A. Holland Engineering Co., Ltd., The	—
282	Baker Perkins Ltd.	—
324	Baker Platinum Division, Engelhard Industries Ltd.	—
233	Balfour, Henry, & Co.	—
210	Barclay Kellett & Co., Ltd.	—
	Bell, G., & Sons, Ltd.	—
250	Bennett, Sons & Shears Ltd.	—
G/Cd.	Berk, F. W. & Co., Ltd.	—
242	Beryllium & Copper Alloys (Safety Tools) Ltd.	—
	Bivac Air Co. Ltd.	cov. iii
270	Black, B., & Son, Ltd.	—
2	Blackman Keith Ltd.	—
204	Blundell & Crompton Ltd.	742
148	Borax Consolidated Ltd.	—
	Borax & Chemicals Ltd.	—
289	Boulton, William, Ltd.	—
228	Bowmans Chemicals Ltd.	—
270	Braby, Fredk., & Co., Ltd.	—
183	Bramigk & Co., Ltd.	—
	British Acheson Electrodes Ltd.	—
224	British Arca Regulators Ltd.	—
217	British Carbo Norit Union Ltd.	—
	British Ceca Co., Ltd., The	—
216	British Chrome & Chemicals Ltd. (London)	—
230	British Chrome & Chemicals Ltd. (Lancs)	—
	British Drug Houses Ltd., The	Front Cov.
	British Geon Limited	—
8	British Industrial Solvents	—
236 & 237	British Laboratory Ware Association Ltd.	—
275	British LaBour Pump Co., Ltd.	—
240	British Lead Mills Ltd.	—
360	British Railway Traffic & Electric Co. Ltd.	—
Spine	British Resin Products Ltd.	—
172	British Rotatherm Co., Ltd., The	—
227	British Steam Specialties Ltd.	—
168	British Tar Products Ltd.	—
	British Thomson-Houston Co. Ltd.	cov. iv
170	British Titan Products Co., Ltd.	—
397	Broadbent, Thomas, & Sons, Ltd.	—
231	Brotherhood, Peter, Ltd.	—
244	Brotherton & Co., Ltd.	—
	Brough, E. A., & Co., Ltd.	—
234	Browns Foundry Co., Ltd.	—
218	Brush Design Group, The	—
175	Bryan Donkin Co., Ltd., The	—
180	Buell (1952) Ltd.	—
272	Burnett & Rolfe Ltd.	—
	Buss Ltd.	—
	Butterworths Scientific Publications	771
201	Butterfield, W. P., Ltd.	—
160	Calder Vale Glassworks Ltd.	—
	Callow, F. E. (Engineers) Ltd.	—
	Callow Rock Lime Co. Ltd., The	—
	Cambridge University Press	770
354	Candy Filter Co., Ltd., The	—
	Cannon (G. A.) Ltd.	—
238	Carbon Dioxide Co., The	—
280	Carmichael, John R., Ltd.	—
243	Catalin Ltd.	—
	Chapman & Hall Ltd.	—
	Chemical Construction (Great Britain) Ltd.	745
191	Chemical Workers' Union, The	—
	Chemicals & Feeds Ltd.	—
318	Chemitrade Ltd.	cov. iii
284	Chesterfield Tube Co., Ltd., The	—
	Chimimport	—
203	Ciech (Poland)	—
264	Cinema Television Ltd.	—
224	Clark, T. C., & Co., Ltd.	—
	Classified Advertisements	778 & 779
258	Clayton Dyestuffs Co. Ltd., The	—
199	Clayton, Son & Co., Ltd.	—
288	Clydesdale Chemical Co. Ltd.	—
285	Clyde Tube Forgings Ltd.	—
213	Cole, R. H., & Co., Ltd.	—
208	Cole & Wilson Ltd.	—
204	Collins Improved Firebars Ltd.	—
	Colt Ventilation Ltd.	—
	Colvin-Smith Ltd.	—
348	Comet Pump & Eng. Co. Ltd., The	—
	Constable & Co.	—
	Controlled Convection Drying Co.	—
	Constructors-John Brown Ltd.	—
4	Crofts (Engineers) Ltd.	—
	Cromil & Piercy Ltd.	—
171	Cruickshank, R., Ltd.	—
334	Curran, Edward, Engineering Ltd.	—
304	Cyanamid Products Ltd.	—
222	Cyclops Engineering Co. Ltd., The	—
288	Cygnet Joinery Ltd.	—
286	Danks of Netherton Ltd.	—
216	Davey, Paxman & Co., Ltd.	—
	Dawson, McDonald & Dawson Ltd.	780
170	Derby Luminescents Ltd.	—
	Distillers Co., Ltd., The	—
161	Dorr-Oliver Co., Ltd.	—
280	Douglas, William, & Sons Ltd.	—
200	Dowlow Lime & Stone Co., Ltd., The	—
	Dring & Fage Ltd.	—
174	Drummond Patents Ltd.	—
195	Dryden, T., Ltd.	—
	Dunlop Rubber Co., Ltd.	—
	Dutt, P. K., & Co., Ltd.	—
232	E.D.C., Ltd.	—
330	Edison Swan Electric Co., Ltd., The	—
	Electric Resistance Furnace Co. Ltd.	—
268	Electronic Switchgear (London) Ltd.	—
244	Electrothermal Engineering Ltd.	—
B/Mk.	Elliott, H. J., Ltd.	—
	Emcer Products	779
	Enamelled Metal Products Ltd.	—
166	English Glass Co., Ltd., The	—
G/Cd.	Erinoid Ltd.	—
207	Evered & Co., Ltd.	—
	Evershed & Vignoles, Ltd.	—
	Fairey Aviation	—
280	Farnell Carbons Ltd.	—
	Fawcett Finney Ltd.	—
	Ferraris, Fred, Ltd.	—
202	Ferris, J. & E., Ltd.	—
	Fleischmann (London) Ltd.	—
220	Film Cooling Towers (1925) Ltd.	—
253	Foxboro-Yoxall Ltd.	—
	Foxflex Ltd.	—
	Fraser, W. J., & Co., Ltd.	—
298	Fuller's Earth Union Ltd., The	—
188	Gallenkamp, A., & Co., Ltd.	—
	Gas Council, The	—
266	Geigy Pharmaceutical Co., Ltd.	—
	General Electric Co., Ltd.	—
	Glebe Mines Limited	—
	Goodyear (Export Div.)	752
290	Graviner Mfg. Co., Ltd.	—
265	Grazebrook, M. & W., Ltd.	—
164	Greeff, R. W., & Co., Ltd.	—
192	Grindley & Co., Ltd.	—
232	Hackbridge & Hewittic Electric Co., Ltd.	—
202	Haller & Phillips Ltd.	746
214	Hanovia Lamps	—
	Hanson Books	—
206	Harris (Lostock Gralam) Ltd.	776
222	Haworth, F. (A.R.C.) Ltd.	—
158	Hearson, Charles, & Co., Ltd.	—
238	Herbert, Alfred, Ltd.	—
	Hickson & Welch Ltd.	780
193	Holroyd, John, & Co., Ltd.	—
234	Honeywill & Stein Ltd.	—
248	Hopkin & Williams Ltd.	—
187	Humphreys & Glasgow Ltd.	—
310	Huntington, Heberlein & Co. Ltd.,	—
310	I.C.I. Billingham Organic	743
	I.C.I. General Chemicals Solvents	—
	I.C.I. Plastics—Darvic	—
	I.C.I. Plastics—Fluon.	—
	I.C.I. Ltd. (Plastics Div.), Corvic	—
	I.C.I. (Florube) Ltd.	—
	Imperial Chemical Industries Ltd.	—

continued on page 744

CARBOYS · PACKED CARBOYS
CARBOY TILTERS AND BARROWS
SAFETY CRATES TOP PROTECTORS

COPPER PLANT
for the CHEMICAL TRADE

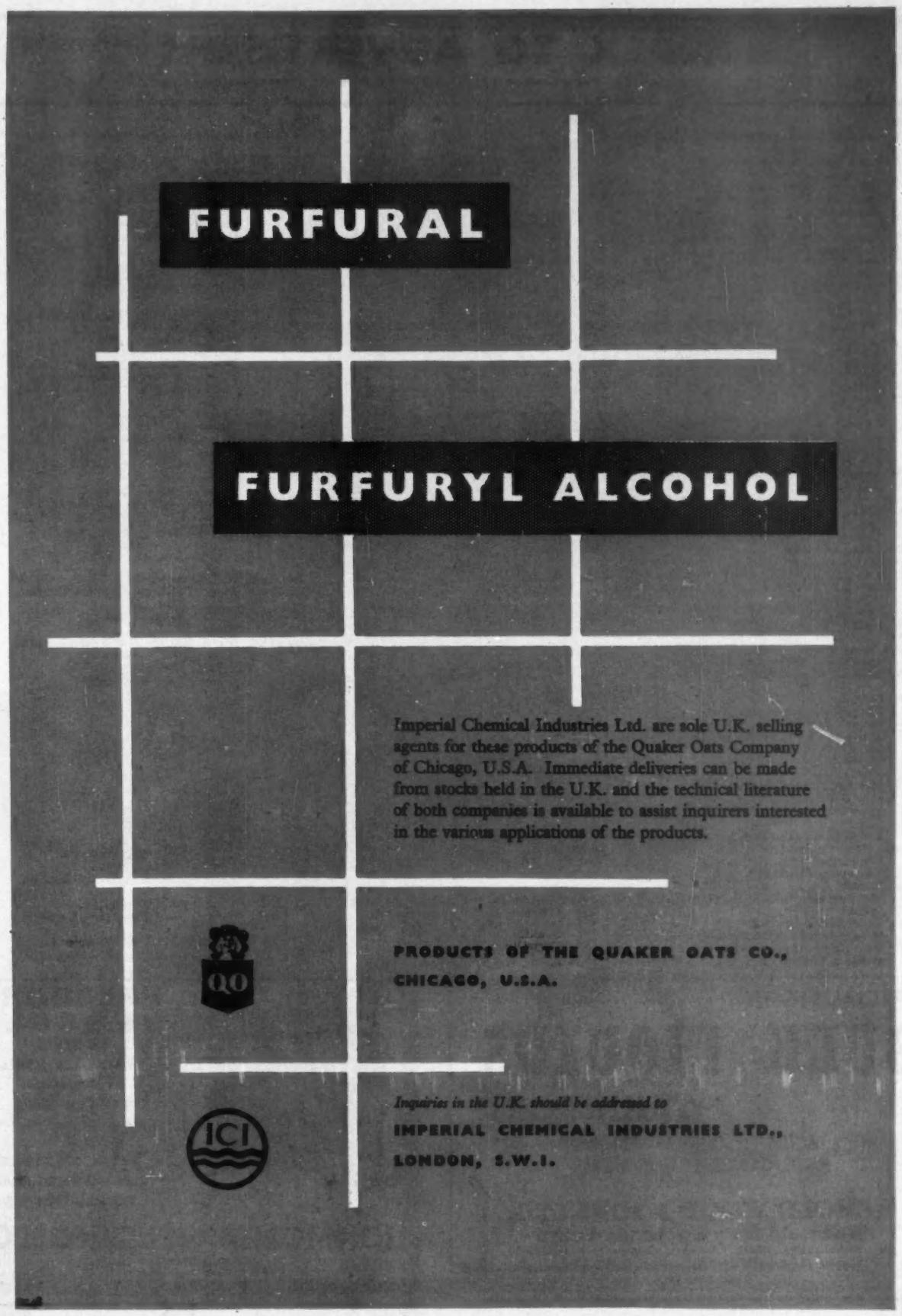


STILLS
RECTIFYING COLUMNS
CONDENSERS

Autoclaves . Calandrias
Vacuum Pans . Boiling Pans
Pipework . Coils . Etc.

Steam jacketed copper Boiler and Mixer to tilt, with vacuum pump and jet condenser. Cover and agitator raised by bevel gear and hand-wheel.

ESTABLISHED 1825
BLUNDELL & CROMPTON
LIMITED
WEST INDIA DOCK RD., LONDON, E14.
Phone: East 3838 (3 lines). Grams: Blundell
1408 & 4160 Phone London


FURFURAL
FURFURYL ALCOHOL
Imperial Chemical Industries Ltd. are sole U.K. selling agents for these products of the Quaker Oats Company of Chicago, U.S.A. Immediate deliveries can be made from stocks held in the U.K. and the technical literature of both companies is available to assist inquirers interested in the various applications of the products.
QO
PRODUCTS OF THE QUAKER OATS CO., CHICAGO, U.S.A.
ICI
Inquiries in the U.K. should be addressed to
IMPERIAL CHEMICAL INDUSTRIES LTD., LONDON, S.W.1.

INDEX TO ADVERTISERS

The first figures refer to advertisement in **Chemical Age Year Book**, *the second to the current issue*

Page		Page
157	Imperial Smelting Corporation (Sales) Ltd.	—
	Industrial & Marine Protective Applications Limited	—
	Industrial Tapes, Ltd.	—
	International Combustion Group	—
	Isopad Ltd.	—
246	Jackson, Henry (Liverpool) Ltd.	—
214	Jackson, J. G., & Crockatt Ltd.	—
245	Jenkins, Robert, & Co., Ltd.	—
249	Jenkinson, W. G., Ltd.	—
3	Jobling, James A., & Co., Ltd.	—
	Johnson, S. H., & Co., Ltd.	—
166	Johnsons of Hendon Ltd.	—
267	Jones, Tate & Co., Ltd.	—
228	K.D.G. Instruments Ltd.	—
178	K. W. Chemicals Ltd.	—
	Kaylene (Chemicals) Ltd.	—
278	Kernick & Son Ltd.	—
395	Kestner Evaporator & Engineering Co., Ltd.	748
395	Kestner Evaporator & Engineering Co., Ltd. (*Keebush*)	—
	Kestner (Industrial Safety) Ltd.	—
	Key Engineering Co., Ltd., The	—
283	Kier, J. L., & Co., Ltd.	—
271	Kleen-e-ze Brush Co., Ltd.	—
206	Lankro Chemicals Ltd.	—
210	Laporte Chemicals Ltd.	748
184	Lavino (London) Ltd.	—
252	Leda Chemicals Ltd.	—
264	Leek Chemicals Ltd.	—
162	Leigh & Sons Metal Works Ltd.	742
	Lennig, Charles, & Co. (Great Britain) Ltd.	cov. ii
	Lennox Foundry Co., Ltd.	—
219	Light, L., & Co., Ltd.	—
274	Lind, Peter, & Co., Ltd.	—
Cover	London Aluminium Co. Ltd., The	—
	Longman Green & Co., Ltd.	—
278	Lord, John L., & Son	—
190	Machinery (Continental) Ltd.	—
	MacLellan, George Ltd.	—
	Mcgraw Hill Ltd.	—
257	Mallinson & Eckersley Ltd.	—
	Manesty Machines	—
342	Marchon Products Ltd.	749
226	Marco Conveyor & Eng. Co. Ltd.	—
168	Matthews & Yates Ltd.	—
	May & Baker Ltd.	—
173	Measuring & Scientific Equipment Ltd.	—
	Meigh Castings Ltd.	—
Cover	Metal Containers Ltd.	—
	Metafiltration Co., Ltd.	—
G/Cd.	Metalock (Britain) Ltd.	—
174	Metcalf & Co.	—
	Metropolitan-Vickers Electrical Co., Ltd.	—
178	Middleton & Co., Ltd.	—
	Mills Packard Construction Co., Ltd.	—
215	Mine Safety Appliances Co. Ltd.	—
	Mirrless Watson & Co. Ltd., The	—
180	Mirvale Chemical Co., Ltd.	—
254	Mitchell Cotts & Co., Ltd.	—
	Mond Nickel Co., Ltd., The	751
	Monsanto Chemicals Ltd.	—
	Morgan Crucible Co., Ltd., The	—
200	Moritz Chemical Engineering Co., Ltd.	—
	Mulberry Co., Ltd., The	—
181	Neckar Water Softener Co. Ltd.	—
268	Nederlandse Emballage Ondeernemming Gebr. de Wilde N.V.	—
221	Negretti & Zambra Ltd.	750
	New Metals & Chemicals Ltd.	—
	Newnes, George Co., Ltd.	—
276 & 277	Newton Chambers & Co. Ltd.	—
239	Nicolson, W. B. (Scientific Instruments) Ltd.	—
177	Nordac Ltd.	—
211	North Thames Gas Board	—
194	Northern Malleable Foundry Co., Ltd., The	—
179	Northey Rotary Compressors Ltd.	—
	Nu-Swift Ltd.	—
	Orr Products Ltd.	—
296	Palfrey, William, Ltd.	—
	Paper Good Manufacturing Co., Ltd.	—
	Pascall Engineering Co. Ltd., The	—
6	Paterson Engineering Co. Ltd., The	—
287	Peabody Ltd.	—
	Penrhyn Quarries Ltd.	779
320 & 368	Permutit Co., Ltd., The	—
G/Cd.	Petrocarbon Developments Ltd.	—
	Petrochemicals Ltd.	741
	Polypenco Ltd.	—
340	Pool, J. F., Ltd.	—
	Pott, Cassels & Williamson	—
358	Powell Duffryn Carbon Products Ltd.	—
G/Cd.	Power-Gas Corporation, Ltd., The	—
169	Price Stutfield & Co., Ltd.	—
	Prodorite Ltd.	—
242	Production Chemicals (Rochdale) Ltd.	—
	Prudential Assurance Co. Ltd., The	—
261	Pye, W. G., & Co., Ltd.	—
	Pyrethrum Board of Kenya	—
	Q.V.F. Ltd.	—
314	Reads Ltd.	—
	Rediweld Ltd.	—
	Richmond Welding Co., Ltd.	744
	Robinson, F., & Co., Ltd.	—
G/Cd.	Rose, Downs & Thompson Ltd.	—
230	Rotometer Manufacturing Co. Ltd.	—
167	St. Helens Cable & Rubber Co. Ltd.	—
269	Sandiacre Screw Co. Ltd., The	—
182	Scientific Glass-Blowing Co., The	—
285	Shaw Petrie Ltd.	—
255	Sheepbridge Alloy Castings Ltd.	—
356	Shell Chemical Co., Ltd.	—
256	Siebe, Gorman & Co., Ltd.	—
350	Sigmund Pumps Ltd.	—
	Simon, Richard, & Sons, Ltd.	—
344	Southern Instruments Computer Division	—
338	Spencer Chapman & Messel Ltd.	—
	Stabilag Co., Ltd., The	—
396	Stanton Instruments Ltd.	—
	Staveley Iron & Chemical Co. Ltd.	—
212	Steel, J. M., & Co., Ltd.	—
	Steel & Cowlishaw Ltd.	—
	Stockdale Engineering Co., Ltd.	—
	Stonehouse Paper & Bags Mills	—
	Streamline Filters Ltd.	—
	Sturge, John & E., Ltd.	—
251	Sutcliffe Speakman & Co., Ltd.	—
279	Taylor Rustless Fittings Co., Ltd.	—
235	Tenaplas Sales Ltd.	—
218	Thermal Syndicate Ltd., The	—
196	Thomas & Bishop Ltd.	—
	Thomason, W., & Sons, Ltd.	—
145	Thompson, John (Dudley) Ltd.	—
	Todd Bros. (St. Helens & Widnes) Ltd.	—
198	Towers, J. W., & Co., Ltd.	—
197	Trent Valve Co., Ltd.	—
160	Tungstone Products Ltd.	—
259	Unifloc Ltd.	—
	Unilever Ltd.	—
	United Coke & Chemicals Co. Ltd.	—
247	United Filters & Engineering Ltd.	—
	United Kingdom Atomic Energy Authority	—
	Vaughan Crane Co., Ltd.	—
192	W.E.X. Traders Ltd.	—
241	Walker Extract & Chemical Co. Ltd.	—
	Wallach Bros. Ltd.	776
263	Waller, George & Son Ltd.	—
161	Walley, A. L.	—
162	Wallis, Charles, & Sons (Sacks) Ltd.	—
	Ward, Thos. W., Ltd.	—
185	Watson, Laidlaw & Co., Ltd.	—
	Weinrebb & Randall Ltd.	—
260	Wells, A. C., & Co., Ltd.	—
182	Wengers Ltd.	—
217	Whessoe Ltd.	—
	Whiffen & Sons Ltd.	747
196	Whitaker, B., & Sons Ltd.	—
163	Widnes Foundry & Engineering Co., Ltd.	—
	Wilkinson, James, & Son, Ltd.	—
186	Wilkinson Rubber Linatex Ltd.	—
273	Willcox, W. H., & Co., Ltd.	—
194	Williams, & James (Eng.) Ltd.	—
172	Wilson, Edward, & Son Ltd.	—
268	Wilde, Gebr. De Nederlandse Emballage Ondernemming N.V.	—
220	Wood, Harold, & Sons Ltd.	744
184	Worcester Royal Porcelain Co., Ltd., The	—
	Worthington-Simpson Ltd.	—
281	Wynn (Valves) Ltd.	—
225	Yorkshire Tar Distillers Ltd.	—
226	Zeal, G. H., Ltd.	—

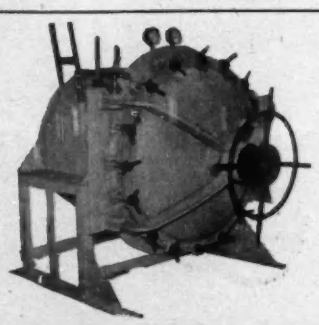
SPECIALISTS IN

BULK LIQUIDS

TRANSPORT

ACIDS · OILS · SPIRITS
AND GENERAL CHEMICALS

HAROLD WOOD & SONS LTD.
Wormald St. · Heckmondwike
Tel.: Heckmondwike 1011/5 Telegraph: 'Transport' Heckmondwike
Temporary London Area Office: Foundry Cottage, Orsett, Grays.
Tel.: Orsett 473

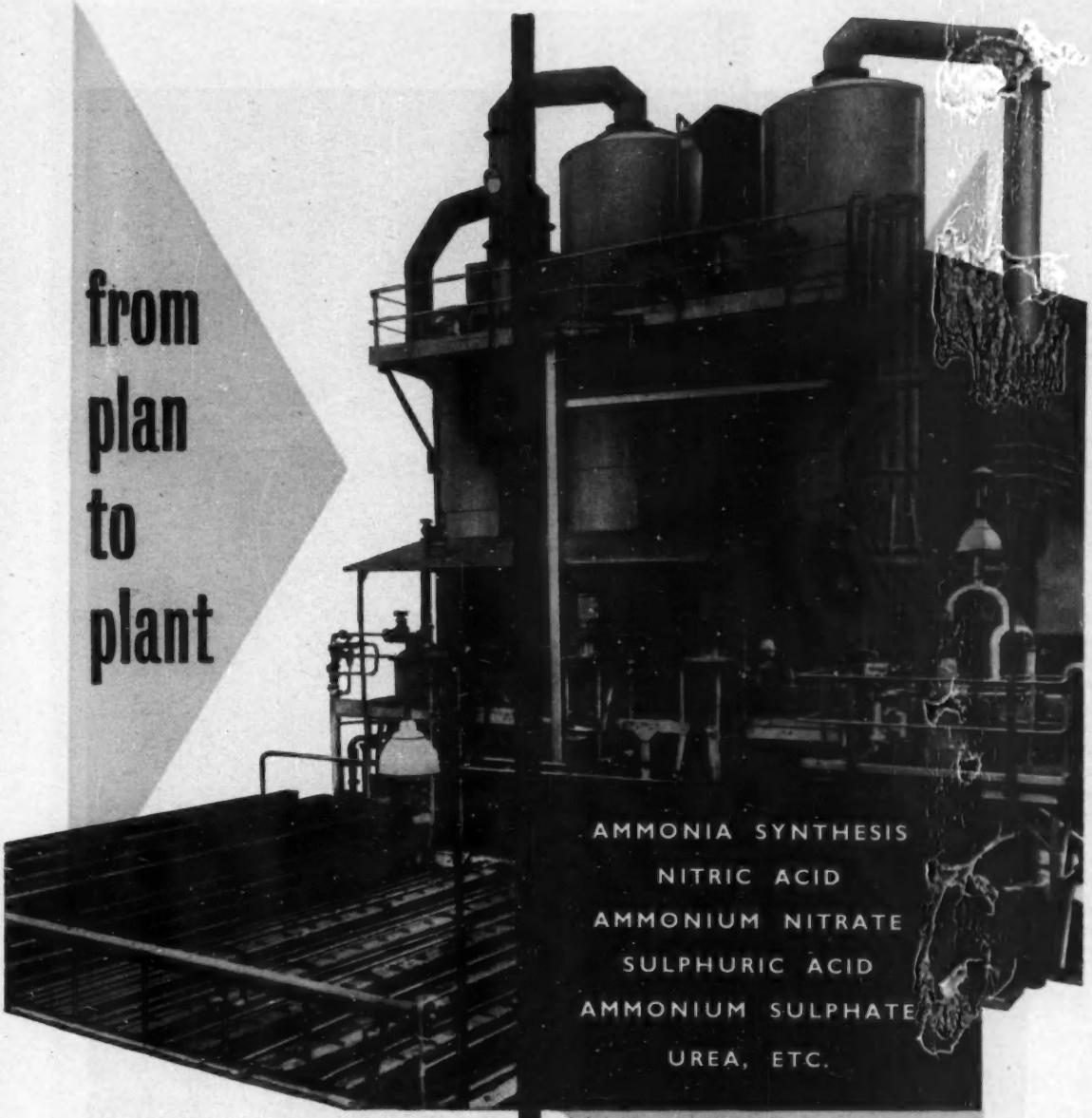


PRESSURE VESSELS
IN STEEL
STAINLESS STEEL
ALUMINIUM
COPPER · ETC.
Welded by the Argon Arc Process

METAL SPRAYING
WELDING AND REPAIRS
TO ALL METALS

RICHMOND WELDING CO.
EST. 1929
RICHMOND RD. · BRADFORD · 7 · Tel: 25405

from plan to plant



AMMONIA SYNTHESIS
NITRIC ACID
AMMONIUM NITRATE
SULPHURIC ACID
AMMONIUM SULPHATE
UREA, ETC.

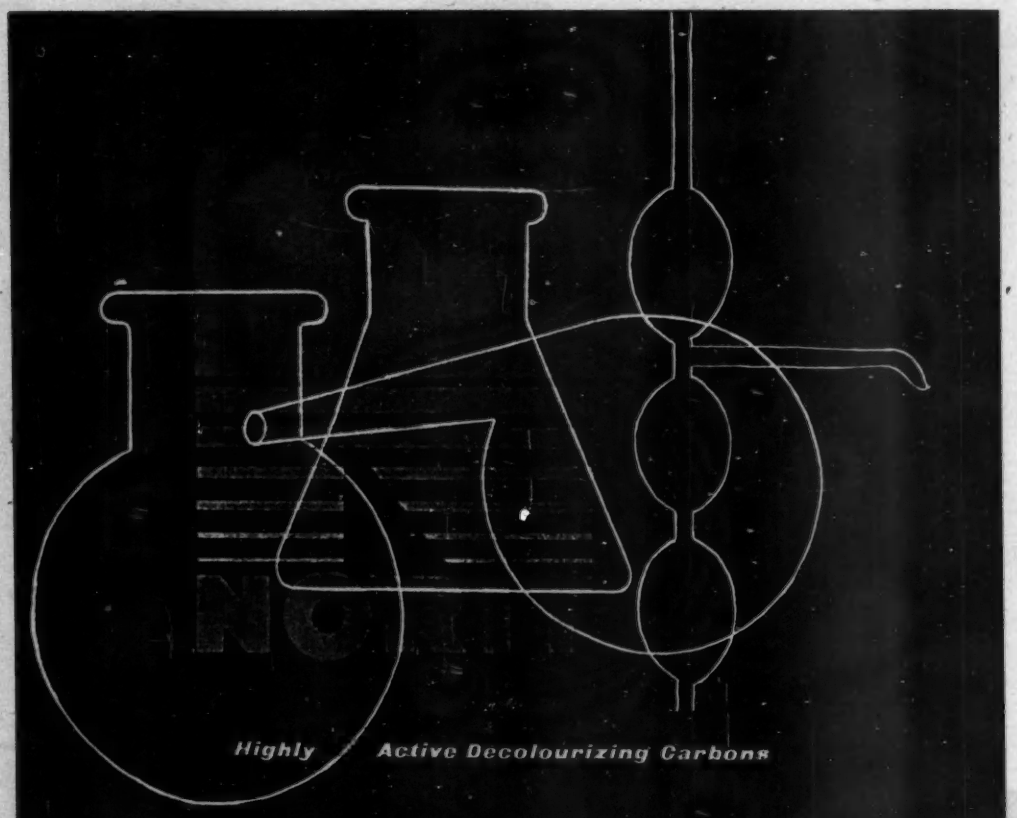
When expansion or replacement necessitates new chemical plant, consider the advantages of placing the contract with Chemical Construction (Great Britain) Ltd. Operating in close collaboration with its American associate — Chemical Construction Corporation, New York — Chemical Construction (Great Britain) Ltd., offers a complete service including the entire planning, design, procurement and erection of chemical plant.

Today, the resources of these two great organisations are at the command of the chemical industry offering progressive companies a unique "plan-to-plant" service.

CHEMICAL CONSTRUCTION (GREAT BRITAIN) LTD.

(Subsidiary of Electric Bond and Share Company, New York)

BUSH HOUSE · ALDWYCH · LONDON W.C.2



Highly Active Decolourizing Carbons

Decolourization and Purification of organic and inorganic chemicals for industrial and pharmaceutical purposes. Special granular grades for solvent recovery, separation of gas mixtures and distillates, or to act as a catalyst-carrier.

United Norit Sales Corporation Ltd., Amsterdam

Representation in United Kingdom

Haller & Phillips Ltd - London E.C.2.
14, Wool Exchange-Basinghall Street
Telephone: MONarch 9041/2

seal off harmful elements

When metallic ion impurities menace your product, seal off all deleterious action positively, permanently, by adding a Metaquest sequestering agent to the mixture. These agents act quickly, safely and effectively by completely sealing off the metallic ions in soluble chelate compounds. They will not decompose on boiling. The list of products and services which benefit by use of Metaquest is long. It ranges from liquid soaps to cosmetics; from rubber to textiles; continuous plating baths to water softening, and laundering, and to agricultural purposes. To ensure the most practical solution to your particular problem, there is the Whiffen's Technical Service Department. At your request a technical representative will be at your service within 48 hours, and your production programme is safeguarded by a delivery service which is both prompt and regular.

WHIFFENS

Industrial and Pharmaceutical Chemical Division of Fisons Limited

chemicals for industry

WHIFFEN & SONS LIMITED, FISON HOUSE, 95 WIGMORE STREET, LONDON, W.1
Telephone: WEL[illegible]
Telegrams: Whiffen, Wesdo, London

W16

DRYING PLANT

KESTNERS ARE EXPERT IN ALL DRYING PROBLEMS

Kestners introduced the first Spray Drying Plant with centrifugal atomisation—the first Rotary Film Patent Drier with multi-blade staggered knife bar and the new Rotodisc Feed—the first Thermo-Venturi Pneumatic Drier—the first Continuous Infra-red Drier with high-intensity Generators. Kestner Drying plants include the following types.

FILM DRIERS

for drying slurries and viscous liquids.
Steam heated or high temperature Fluid heated. Infra Red heated machines supplied for special purposes. Particularly suitable for drying adhesives, chalk, pigment, foodstuffs, neutral salts, etc.

INFRA RED DRIERS

Specially developed for drying powders or granulated materials down to ultra low moisture content.
Particularly suitable for drying tartaric acid, metallic salts, fine chemicals, etc.

SPRAY DRIERS

for producing a uniform dry powder from a wide variety of solutions or solids in suspension in one operation. Drying is instantaneous and discharge of the finished product is continuous—thus enabling heat sensitive materials like milk, blood plasma, etc., to be dried just as easily and efficiently as chemicals, such as magnesium sulphate, tan extracts, soaps, detergents, etc.
Special features include centrifugal atomisation; no jets to block; feed by gravity or low pressure pump; no overheating of sensitive products.

T.V. DRIERS

A pneumatic drier specially suitable for handling damp materials, filter cakes and granular semi-solids. Particularly suitable for drying starch, sand, chalk, clay, aspirin, activated earth, salt, carbonates, etc.

We also make other driers for specialised applications.

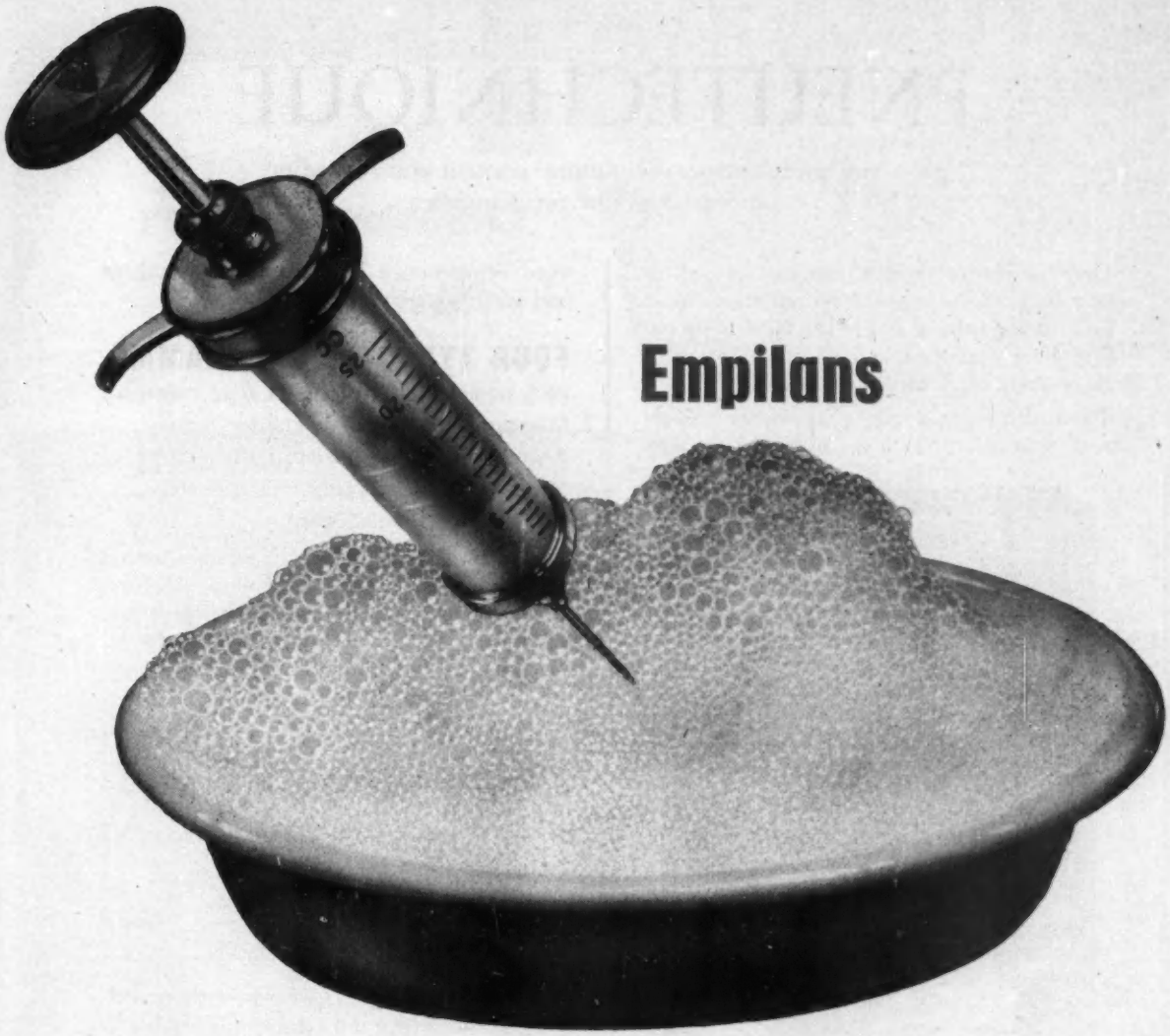
KESTNER EVAPORATOR & ENGINEERING CO. LTD. • 5 GROSVENOR GARDENS • LONDON S.W.1

Laporte Chemicals for Industry

- Hydrogen Peroxide
- Sodium Perborate
- Organic Peroxy Compounds
- Barium Compounds
- Sodium Sulphide
- Detergents

LAPORTE

Laporte Chemicals Ltd., Luton. Telephone: Luton 4390. Telegrams: Laporte, Luton.



inject power into foam

—for equal cost, an increase in foaming power and sales appeal. (Alternatively, a minor addition of an Empilan Foam Booster cuts down your product cost without loss of efficiency).

Other advantages of using Empilans are

Development of a soft 'feel'
Gearing of foam stability to detergency end-point
Easy incorporation—available as paste, flake, liquid or powder.

Please write for technical bulletins.

EMPILAN series of fatty acid alkylolamides.

Part of a complete range of detergent chemicals manufactured at Whitehaven and sold all over the world.

AGENTS & OFFICES IN PRINCIPAL CITIES OF THE WORLD

HEAD OFFICE: Whitehaven, England. Telegrams: Marchonpro, Whitehaven, Telex.
LONDON OFFICE: 140 Park Lane, London, W.1. Telegrams: Marchonpro, London, Telex.
Member of the Albright & Wilson Group of Companies.

Marchon PRODUCTS LIMITED

MAR 6035

PNEUTECHNIQUE

gives you push-button programme control and recording for four types of programme

Here is control which can be applied to processes where temperature variations must be accurately timed and held. Here is simple push-button control, and visual indication of the current stage of the process.

Standardised pneumatic components are arranged in circuit to form an automatic pro-

gramme recorder controller. There are no cams and there is no capillary tubing, for temperature measurement is carried out by a highly sensitive air-operated force-balance type Temperature Transmitter. Adjustment and servicing are simplified.

FOUR TYPES OF PROGRAMME,

each obtainable by means of four controls:

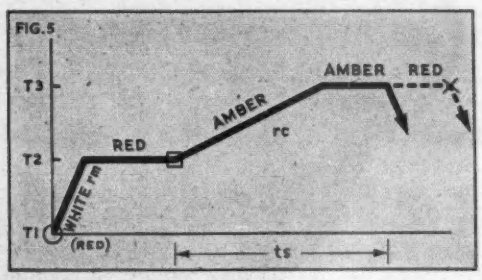
Minimum Process Temperature Setting . . .

Required Rate of Temperature Rise Setting . . .

Maximum Process Temperature Setting . . .

Total Process Time Setting.

These controls are infinitely variable within the limit of operation. Programme selection and initiation is by push-button operation. Progress is indicated through all stages by means of multi-coloured indicator lamps.

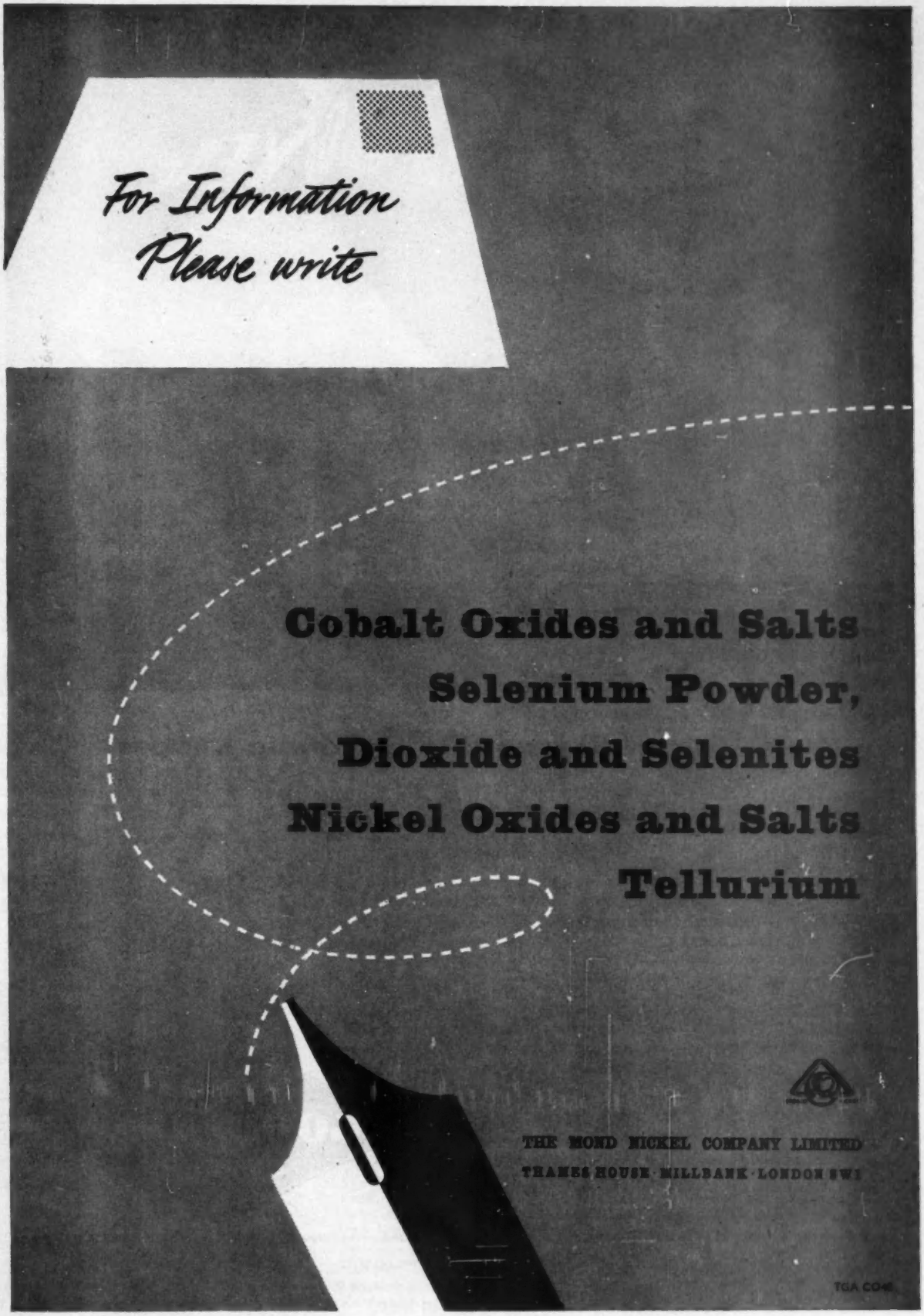


GRAPH shows five temperature changes with corresponding light indicators: (1) Maximum rate of rise to minimum process temperature, when (2) process may be held until (3) controlled rate of rise to maximum is required. (4) Temperature is held until automatic or push-button shut down.

May we send you copies of fully illustrated descriptive booklets T 39/1 and R 36?

NEGRETTI & ZAMBRA

NEGRETTI & ZAMBRA LTD.,
122 REGENT ST., LONDON, W.1 REGent 3406


For Information
Please write
Cobalt Oxides and Salts
Selenium Powder,
Dioxide and Selenites
Nickel Oxides and Salts
Tellurium
THE MOND NICKEL COMPANY LIMITED
THAMES HOUSE · MILLBANK · LONDON SW1
TGA CO46

Now—A New Standard in Synthetic Rubber!

On April 28, 1955, Goodyear assumed ownership of the United States Government synthetic rubber plant in Houston, Texas. Then Houston GR-S (Government Rubber-Styrene) became PLIOFLEX – another proud product of Goodyear. But much more than a mere change in names occurred.

In the short time PLIOFLEX has been on the market, it has set a whole new standard of quality and service in the manufacture and supply of styrene rubber. For when you buy PLIOFLEX, you get much more than the usual advantages of man-made rubber – tailored properties, high uniformity, steady supply and low cost.

When you buy PLIOFLEX, you get the benefit of over 30 years' experience in the development, production and application of styrene rubber. This results in PLIOFLEX being the finest rubber made—as well as being accompanied by a complete knowledge of how to use it to best advantage.

As an authorized distributor of PLIOFLEX, we will be pleased to supply you with full details on how it can best serve you in the manufacture of shoe soles, mechanical goods, flooring, housewares, toys or other products.

CHEMICAL
GOODYEAR
DIVISION

Distributed in the United Kingdom by:

HUBRON SALES LTD., FAILSWORTH, MANCHESTER

TEL: FAILSWORTH 2691

Other Distributors in All Western European Countries

Goodyear International Corporation, Chemical Division, Akron 16, Ohio, U.S.A.

CHEMIGUM • PLIOFLEX • PLIOLITE • PLIOVIC • WING-CHEMICALS

High Polymer Resins, Rubbers, Latices and Related Chemicals for the Process Industries

Chemigum, Plioflex, Pliolite, Pliovic –T. M.'s The Goodyear Tire & Rubber Company, Akron, Ohio, U.S.A.

VOL. 78 No. 2000

9 NOVEMBER 1957

Telephone: FLEet Street 3212 (26 Lines)
Telegrams: Allangas - Fleet - London

Editor M. C. HYDE
Manager H. A. WILLMOTT
Director N. B. LIVINGSTONE WALLACE

Midlands Office
Daimler House, Paradise Street, Birmingham. [Midland 0784-5]

Leeds Office
Martins Bank Chambers, Park Row, Leeds 1. [Leeds 22601]

Scottish Office
116 Hope Street, Glasgow, C2. [Central 3954-5]

IN THIS ISSUE

US Sulphuric Acid Prices	754
BCPMA Annual Dinner	755
ICI Form New Division	755
Distillates	756
Crosfield Extensions at Bow	757
US Liquefied Methane Plans	758
Nitrogen Surplus	758
Chemical Sources of Rocket Power	759
Radiochemical Centre Extended	760
SAC Midland Meeting	761
Overseas News	763
New US Ethylene Oxide Plants	764
Italian Synthetic Rubber Plant	765
UK Sulphuric Acid Returns	766
Equipment Review	767
Nobel Prize for Chemistry	769
Chemist's Bookshelf	770
People in the News	773
Commercial News	774
Market Reports	774
For Your Diary	774
Chemical Stocks and Shares	776
Trade Notes	776
New Patents	777

Annual subscription is: home, 52s 6d, overseas, 60s, single copies 1s 6d (by post 1s 9d)

CHEMICAL AGE

BOUVERIE HOUSE · 154 FLEET STREET · LONDON · EC4

UK RESEARCH NEEDS

TOTAL expenditure on research and development in 1955–56 was about £300 million of which £120 million was devoted to civil purposes. This information is given in an important study of the nation's scientific resources made by the Advisory Council on Scientific Policy (Annual Report Advisory Council on Scientific Policy, 1956–57. Cmd. 278. Stationery Office, 1s 4d).

The Council's annual report contains besides this note the comment that the figure of £120 million, which is 40 per cent of the total, is 'far too small for the country's needs'. Once again this report emphasises that Britain's competitive position is dependent on economic development of new products and processes. Also the hope is expressed by the Council that as a result of defence cuts scarce scientific manpower will be released by defence establishments for civil work. It is also urged that substantially more university places for science and technology should be provided than was proposed a year ago.

Examination of the report shows that in 1955 the total spent on research and development corresponded to about 1.6 per cent of the gross national product at market prices. Expenditure by industry was about 0.8 per cent of industrial output. It will be recalled that US figures, although for 1953, suggested US expenditure was about 1.5 per cent of the gross national product. However, industry expenditure was about 1.9 per cent of net output, approximately twice Britain's.

In this country, while the Government or Government-controlled establishments do 30 per cent of the work, the Government provides about three-quarters of the total funds and about 60 per cent of total expenditure comes under Government expenditure on defence. Industry carries out nearly two-thirds of the work but provides finances for only about a quarter.

It is pointed out that concentration of effort is difficult because the many small companies and long-established traditions slow the rate of change. To offset these difficulties, the Council recommend examination of the use of civil research and development contracts and the possibility of finding a few large organisations which could take the place of defence departments in placing orders with companies equipped and capable of carrying out work of value on the civil side. Here, of course, the universities could be of supreme importance. The report indicates that there are teachers, research fellows, students and assistants engaged in research in universities equal to about 9,000 full-time workers.

What is disturbing about the Council's report is the evidence about emigration. Admittedly the information on emigration of scientists and engineers is 'inexact, incomplete, but also conflicting'. Also, there appears to be little evidence that an undue proportion of the better students are leaving Britain. Nevertheless, the Council is keeping the situation under review, particularly as it seems that there have been inquiries about posts abroad. In the past seven years about 190 post-graduate chemists and 145 physicists on leaving universities for employment or fellowships in the US or Canada intend to stay there—a loss of about 6 per cent and 10 per cent of the post-graduate chemists and physicists leaving the universities.

University department heads, it is reported, are concerned about recruitments

by US companies, and the lure of US universities which offer better facilities and equipment for research studies.

At present, the loss of scientists and engineers, at a time when there is a scarcity of such trained persons at home, to the US rather than to Commonwealth countries, must be deemed serious. The Council make the interesting suggestion in this respect that British industry should set up an organisation in the US and Canada whereby graduates from these countries can be interviewed on behalf of British employers. Other helpful suggestions are that encouragement should be given to British scientists to do more post-graduate work in Europe, and the quick settlement of a site for a national reference library of science and invention.

The annual reports of this Council, which has been in being for 10 years, offer informed, comprehensive, and searching views of the country's scientific research and development and manpower needs. The present report emphasises once more that unless conditions are made attractive for Britain's scientists and engineers, the country will lose those interested in post-graduate work to the US or Canada. In particular, with defence cuts now being implemented, many of the scientists attached to present defence departments may well see only opportunities on the other side of the Atlantic. Another issue which the report stresses is the lack of research in the industrial field.

Due note should be taken by the Government regarding the small firms who for various reasons do not contribute to research efforts. It is only right, though, to say that these companies can do more than they have or are doing now by supporting the many excellent research associations, which cover all aspects of research.

US SULPHURIC ACID PRICES

FURTHER to the report that two US sulphur producers had reduced Frasch-mined sulphur prices by $3.00 a ton (see CHEMICAL AGE, 19 October, p. 652) there is now a suggestion that US producers may reduce sulphuric acid prices. Usually sulphuric acid prices are responsive to changes in raw materials and processing costs.

The present price of the acid in the US is $22.35 per ton for 66° Bé. product—a price that has prevailed since 1954. It appears, however, that US producers are non-commital at the moment since some consider that a reduction in price would not be appropriate now. Reasons advanced are that the lower sulphur costs are offset by the increase in transport costs this year and the cumulative increases in labour, manufacturers production and other charges over several years.

According to a note in the latest *Baird Facts* (Vol. 2, No. 1, November) recent sulphur price reductions will eventually reduce the price of sulphuric acid and other sulphur chemicals but not nearly as much as might be expected by the $3 per ton cut in sulphur prices. Others also take the view that prices of the acid will reflect the new raw material cost as soon as the higher-priced sulphur bought on contract is burned up.

In the US the sulphuric acid market is highly competitive with some 70 manufacturers and distributors in the field. There has also been some reduction in consumption of acid this year, which has also disturbed the acid market.

It is recorded (*Chem. and Engng. News*, 1957, **35**, No. 43, 32) that in the first half of this year output from both captive and outside plants was 1,272,799 short tons compared with 1,367,155 tons in the same period of 1956. One of the largest outlets for sulphuric acid, superphosphate fertiliser, took less acid. US fertiliser requirements of acid are estimated to take 33 per cent of the total sulphuric acid output, with steel, rayon and transparent film industries accounting for about 12 per cent.

After lagging somewhat in the early part of this year, acid demands by these three industries are now stated to have improved slightly. Cellulose acetate production, using acid on almost a pound-for-pound basis, is estimated at about 475 million lb. a year. During 1958 another 100 million lb. will be added to this total as American Viscose and Du Pont bring their new plants into operation.

Lower operating rates have also been recorded for the first six months of this year for the other major chemical uses of the acid, such as ammonium sulphate, both coke oven and synthetic. Production for both was 1,040,957 short tons for this year against 1,077,303 tons for the first six months last year.

Mexican sulphur producers have now given their answer to the US producers who reduced sulphur prices by $3 a ton. The latest development is that Mexican export prices are now down to $23 and $22 per ton on filtered and dark sulphur respectively, hence unsettling the market.

Chances that a 'price war' is now imminent, however, are considered unlikely. The reasons suggested are that the present reductions will already affect company earnings while further cuts in domestic or export prices will not increase sales significantly. Perhaps even more interesting is that some US quarters think it very possible that a major US producer may increase sulphur prices to the pre-reduction level. In the meantime there is pressure in the US for a 25 per cent duty.

'ENEMY-OWNED' PROPERTY IN US

PENDING the hearing by the US Supreme Court of the appeal by Interhandel's in regard to a lower court decision on the sale of General Aniline and Film the company's stocks are held by the Justice Department. Interhandel, a Swiss holding company, has been trying for the last eight years to regain control of General Aniline. In August, the US Court of Appeals turned down Interhandel's last appeal, put in when the US Alien Property Custodian offered the company for sale.

The US Supreme Court is to hold its hearing 'soon'. In the meantime, preliminary hearings on the case have been heard by the international tribunal of the International Court of Justice in The Hague, to whom the case was taken by the Swiss Government who are backing Interhandel's claim to General Aniline and Film.

This law suit should command far wider notice than it appears to be doing, for in effect what is now really at stake is Switzerland's relationship to the US. It is not merely a question of whether or not the Swiss company Interhandel is dominated by German interests, which has been strongly denied with evidence to back this denial. The importance lies in whether disputes arising in the operation of international agreements are to be settled by arbitration or not.

Also at stake is the principle of the sanctity of private property, even enemy property, and the obligation, up to now respected, of all governments to restore seized property to its rightful owners when hostilities cease. The US Government is under the obligation to restore General Aniline after the war, because it was privately owned. However, General Aniline is not enemy-owned, but Swiss. Moreover, during the last session of Congress, a Bill sponsored by Senator Olin D. Johnson, was introduced into the Senate for the release of all enemy property. Should the Bill become law, the release of General Aniline, if still regarded by the US as enemy-owned, would automatically follow.

Further, President Eisenhower, himself announced at the end of July this year that the historic practice of the US Government was to respect the sanctity of private property, even in time of war and that all enemy-owned property was to be released early in 1958.

In the light of the above, what is puzzling is why the US Justice Department defy The Hague Court, proclaiming that its verdict regarding the sale of General Aniline would in no way influence the action of the American authorities.

FREE TRADE DISCUSSED AT CHEMICAL PLANT DINNER

. . . Will help the strong and the hard working

G. N Hodson

Sir Hugh Beaver

Little doubt that we shall have free trade area . . .

COUNCIL of the British Chemical Plant Manufacturers' Association, having considered the projected European free trade area earlier in the day, felt that on balance it must support the Government, but added the proviso that there must be safeguards to ensure that competition was fair. That was stated by Mr. G. N. Hodson (Hathernware Ltd.), association chairman, when he proposed the toast of 'The Guests' at the annual dinner held in the Grosvenor House, London, on 30 October.

There was a record attendance of 650. The chief guest, Sir Hugh Beaver, president of the Federation of British Industries and of the Institution of Chemical Engineers, also referred to the free trade project when he replied on behalf of the guests.

Mr. Hodson said the council was aware that reactions to the free trade area varied not only from industry to industry but also from firm to firm within an industry. It must be remembered that the impact of free trade would be gradual.

In his own opinion, the result would be to help the strong, the quick-witted and the hard-working, while the weak, the ordinary and the idle, would have even more reason than usual to complain of life's inequalities. Competition would be keener, so too would the opportunities be greater. Mr. Hodson added 'I must strongly emphasise, particularly to those friends of ours in Government service that the Government must provide a climate in which the competition we meet is fair, that our conditions of exporting are not inferior to those of our neighbours, that we are allowed to keep enough of our earnings to re-equip our factories, and that a little more than lip-service should be paid to the problems of inflation.'

Virile Industry

Whether the free trade area turned out to be a boon or a disaster to Britain depended as much on Government as it did on industry.

He declared that: 'There is a lot to be said for being suppliers to a virile and expanding industry'. In that connection capital investment in the chemical industry rose from £33 million in 1948 to more than £100 million in 1956 and in the period 1948 to 1956 totalled over £600 million. Future plans reported indicated that expansion would continue and in petrochemicals alone, it was expected that the total capital investment of £55 million in 1955 would have been doubled by the end of 1958.

In the field of nuclear power, there must be few members of the association who had not made some contribution. The BCPMA was a founder member of the Nuclear Energy Trade Associations' Conference.

Referring to the fact that the latest edition of their directory 'British Chemical Plant' would be published early in November, Mr. Hodson said 'British industry as a whole is a bit backward in telling the world of its achievements. We are doing our best to remedy that state of affairs'.

A special welcome was given to Mr. S. C. Bishop, who after being responsible at the Ministry of Supply and Board of Trade for the affairs of the chemical plant industry for more than 10 years, was shortly to retire. Mr. Hodson thanked him for all the help he had given both to the BCPMA and to individual members.

Chemical Engineers

Welcoming Sir Hugh Beaver, he said that the association had always been closely identified with the work of the Institution of Chemical Engineers and many chemical engineers from BCPMA member-firms continued to make their contribution to the work of its council and committees. The association's council was gratified that Dr. E. H. T. Hoblyn, their director, had recently been elected a vice-president of the institution. They were also pleased that Dr. Hoblyn was to be actively concerned with its work within the European Federation of Chemical Engineering.

Replying to the toast, Sir Hugh declared, 'I think there can be little doubt that we shall have a free trade area'. He gave two reasons for that belief, firstly, for influential political reasons and, secondly, because it was an evolution that present conditions were forcing on the countries concerned. He thought, personally, that it was a good development. It would herald a period of challenge and turmoil, but the country would have more to fear if it staved out and did not take the opportunity of widening its chances.

The important question was 'Are other Governments and our own Government going to see that we have fair competition'. There were doubts on this score and he thought they were largely due to the one single question of whether they would be able to compete fairly. He declared, 'What most of us feel is that whereas we will keep any bargain whether in the end it suits us or not, other parties will not be so scrupulous.' That had been borne out by past experience. If it could be eradicated, there would be almost unanimous support for the free trade plans.

Referring to the achievements of the chemical plant industry in the export field, Sir Hugh hoped they would take the opportunity of greater trade afforded by the visits from the Chinese and Canadian delegations to this country.

Overseas selling was of little avail, however, unless British industry operated from a firm basis at home. The Government had declared its intention of seeing the present battle against inflation through to the end, however unpleasant that may be.

Sir Hugh added, 'But it is quite clear that it is not only with the Government that the responsibility lies, it also lies with ourselves. We cannot honestly claim that there should be a curtailment of all the programmes for the Government, but that there should be no effort on our part to limit our own programme. If you believe that inflation is the great evil then we must be prepared to put up with quite a lot of inconvenience if we are to come out clear on the other side'.

ICI to Form Heavy Organic Chemicals Division

Two major changes in the organisation of Imperial Chemical Industries Ltd. were announced late on 30 October by the company's board. A new manufacturing division, to be known as the 'Heavy Organic Chemicals Division' is to be set up. It will take over as from 1 January 1958, Billingham division's interests in organic chemicals, based primarily on petroleum. At the same date all aspects of the company's polythene work will be unified by transferring all responsibility for production, research and development, together with assets and staff employed in the production of Alkathene from ICI's alkali division, where the material was first discovered, to ICI's plastics division.

The decision to separate the Billingham division's interests in organic chemicals has been taken because of the continuing growth in size and complexity of the division both in the organic and inorganic chemical fields.

Chairman of the new heavy organic chemicals division will be Dr. S. W. Saunders who is, at present, a managing director of Billingham division.

Purification Plant on Mersey

The south eastern area committee of the Mersey River Board in their quarterly report on pollution state that at the CPA Newton Bank Printworks, Hyde, Ches., where a £60,000 purification plant was built in 1954, a scheme has been completed to reduce the alkalinity of the effluent and work is being done on the firm's sludge disposal problem.

★'WE ARE on holy ground here,' exclaimed Sir Robert Robinson, a former president of the Royal Society, before unveiling a plaque to the memory of Sir William Henry Perkin at the Greenford works where he discovered the dye mauvine in the spring of 1856. Within six months, the dye was being produced at the factory.

Sir Robert added that the turnover of the gigantic industries that grew from the discovery now ran into thousands of millions of pounds. The works is now the factory of Durasteel Ltd., where under the direction of Mr. Stewart Galt, Galt glass, a resin-bonded glass fibre sheeting, is made.

Mrs. Betty Perkin, a descendant of Sir William, presented a small piece of mauve cloth, from the first batch dyed by Perkin, to Mr. T. R. Cowper, chairman of Durasteel. Among the guests at the ceremony were Sir Harry Jephcott, chairman of the Research Council, DSIR; W. H. Palmer, managing director, Glaxo; W. H. Cliffe and D. Mason from ICI dyestuffs division; and Dr. J. H. Bushill, deputy chief chemist of J. Lyons and Co. Ltd.

★A RECENT visitor to Brazil to study economic conditions in that country has been Dr. A. Wilhelm, vice-president of the Ciba organisation and a past president of the Swiss Chemical Industries Association. Dr. Wilhelm is understood to be interested in increasing his company's industrial interests there.

The Ciba organisation has in fact recently been expanding its activities in chemical and pharmaceutical production in Brazil, and new factories with highly specialised equipment and technicians are being installed.

The Swiss Minister, on his return to Rio de Janeiro recently, confirmed that Swiss investments in Brazil are increasing. Specific cases which can be cited are Ciba-Sandoz-Geigy, representing three of Switzerland's main chemical and pharmaceutical houses, who have set up an aniline dyes factory near Rio; and Brown-Boveri, producers of heavy electrical equipment.

★TWENTY-FIRST birthday of the laboratory of the Mond Nickel Co's development and research department was celebrated with a dance at the Grand Hotel, Birmingham, on 21 October. During the evening, Dr. W. Steven, superintendent of the laboratory, presented a silver cigarette box to Dr. L. B. Pfeil, the original superintendent, who is now a director of the company.

Opened in 1936 with a staff of 16, the laboratory now has a staff of more than 180. In the past 21 years, the laboratory, which is devoted to the study of nickel and its alloys, has been responsible for the development of many new and valuable alloys, particularly the Nimonic series of high temperature materials. These enabled the theory of the gas turbine to become a practical reality. Alloys have also been developed for use in the chemical industry.

Members of the laboratory can also claim to have played an important part in the development of the new spheroidal graphite cast iron and have contributed many papers on the various theoretical aspects of metals, particularly transformations in special alloy steels.

★LAST WEEK the Institution of Chemical Engineers formally announced that it had joined the European Federation of Chemical Engineering. This news was first given in this column on 22 June. In addition to the two previous secretariats in Frankfurt, at the offices of Dechema, and in Paris, at the Société de Chimie Industrielle, the federation now has a London secretariat at the institution's h.q. at 16 Belgrave Square, SW1.

At the annual dinner last week of the British Association Chemical Plant Manufacturers' Association, president Mr. G. N. Hodson said the association was pleased that its director, Dr. E. H. T. Hoblyn, had been appointed a vice-president of the institution and would be actively connected with its work in the federation.

★FIFTY SHILLINGS a week and meals with the foremen! That was the prospect that faced science graduates more than 50 years ago and one that contrasts vividly with the modern pre-examination scramble of today.

Professor W. Wardlaw, president of the Royal Institute of Chemistry recalled conditions of former days when he responded to the toast of the RIC at the London section's annual dinner-dance last week. The person offered the 50s.-a-week job was now a consultant who had followed the practice of going to Germany after graduation. He had returned to this country for a rest.

Another man who got his first job 20 years later was one of 364 applicants. One of a lucky half-dozen to be interviewed, he was asked what salary he had in mind. When he asked for £250 a year, he was told the firm had in mind a sum of about half that figure!

Today, said Professor Wardlaw, the graduates' services were being sought long before the examination stage by 'the circuses of the great companies.' Now the graduate was interviewing the company, from the graduates' point of view, a much brighter position. It is, however, necessary to draw the right conclusion. The man-in-the-street continually overlooks the work of the scientist and seldom realises the great debt that he owes to scientific achievement.

★ON 3 NOVEMBER, Mr. George West, 29-year-old assistant manager of the export department of the chemicals division, Newton Chambers and Co. Ltd., Thorncliffe, began a 20,000-miles business tour of Commonwealth countries and the Far East. He is following in the footsteps of his father, Sir Harold West, the company's former managing director, who made a similar trip in the 1920's and who appointed many of the agents now to be visited by his son.

Part of Mr. West's task will be to discover how the demands for such Izal products as disinfectants, antiseptics and wood preservatives, have been affected since the war.

He has been with Newton Chambers since 1954 and on his return will be making plans for his wedding early next summer to Miss Moya Cleary, daughter of Dr. and Mrs. M. J. Cleary of Grindleford.

★DR. P. A. LINTERN, recently appointed overseas controller of British Titan Products Co. Ltd., York, is on his way to visit the works of Australian Titan Products Pty. at Burnie, Tasmania. This subsidiary of British Titan has undertaken a large expansion programme, estimated to cost £2¼ million sterling and the parent company is providing a large share of the necessary capital.

The original Burnie plant started operations in 1949 and was designed to produce 1,800 tons a year. To-day it is producing an annual rate of 8,000 tons and extensions already authorised will raise this to 10,000 tons. The new expansion project is planned to increase capacity to 20,000 tons.

On his way to Tasmania, Dr. Lintern will make a brief stay in India to discuss factory extensions of Travancore Titan Products, in which British Titan have an interest and for consultation with raw material suppliers. He will also visit the US before returning to the UK early next month.

Alembic

CROSFIELD OPEN BOW EXTENSION

Can Produce Silicate as Glass or Liquor

AT the opening of the extension to the Bow plant of Joseph Crosfield and Sons Ltd. Dr. J. E. Taylor, chairman, said that a very large furnace adjacent to the dissolving and finishing plants at Bow has just been brought into production. The company now has the only complete manufacturing unit in the south of England capable of producing silicate as glass or liquor. The whole of the production of this unit will be available for industries throughout the southern part of the country and is intended to maintain existing efficient service and delivery in the face of future increased demand.

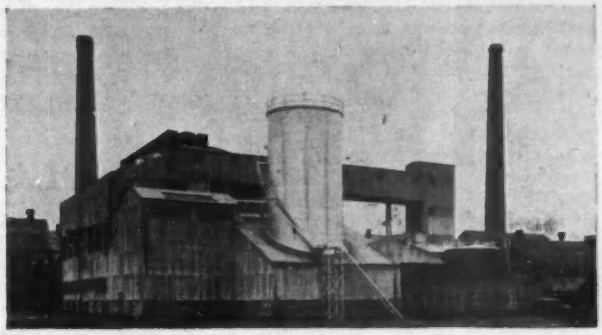
Dr. Taylor stated that the demand for silicates in the London area and Southern England generally had continued to increase. It was 300 per cent greater than it was when Joseph Crosfield installed their first dissolver at Bow in 1938. Most of this increase had taken place in the post-war years, and now the state of this market was such that it would support the output of a large furnace.

Joseph Crosfield have been operating in Warrington in Lancashire since 1815 and are one of the largest soap and detergent manufacturing companies in the Unilever group. They are also the only Unilever company producing inorganic chemicals.

The process for the manufacture of sodium silicate has been carried out for many years at Warrington, but just before the war, as a result of the growing demand for silicates in the south, Joseph Crosfield installed a plant at Bow for the dissolving of silicate glass and treatment of the subsequent liquor, but the glass continued to be made in the north.

That the company no longer have to transport silicate glass from Warrington is a great advantage in off-setting continually increasing freight charges. As sodium silicate itself is a cheap commodity, cost of distribution forms a high proportion of total costs. Although the company have to cover depreciation on a new plant and increased carriage costs on one of the raw materials, Dr. Taylor said that they hoped that carrying out the complete manufacturing process at Bow would enable the company to continue still further the price stability maintained since 1955.

Joseph Crosfield anticipate that some of the silicate from the new furnace will be exported, probably in its glass form, as they already have a healthy export business with over 60 countries. Up till now this has been carried out from Warrington through Liverpool. Some destinations—notably Europe and the Near East—would be better served from Bow as this has a convenient canal for waterborne transport to the Port of London. The company expect that the new furnace will allow them to offer better delivery dates and a marked speed up of consignments to these areas, a fact which, as Dr. Taylor remarked, may assume ever greater importance in a European free trade area.



The new furnace buildings are seen centre in this general view of the Crosfield factory at Bow

The new furnace would also have its effects in the north, said Dr. Taylor, for now that part of the silicate produced at Warrington did not have to be diverted to Bow, larger quantities would be available for their northern customers. It would also release supplies for experimental work in the development of silicate chemicals. An example of these, instanced by Dr. Taylor, was calcium silicate which the company put on the market two months ago.

The new plant has been constructed under the direction of King, Taudevin and Gregson of Sheffield, the furnace specialists. The F.C. Construction Co. Ltd., Derby, have been responsible for the civil engineering, and the Lambhill Iron Works Ltd., Glasgow, have been responsible for the structural steel work. Polysius of Ascot have installed the bulk handling equipment for soda ash and the sand drying plant was supplied by Edgar Allen of Sheffield. The company's own engineering department have also been actively concerned during the planning stage and during all the subsequent demolition and erection, and Mr. J. A. Connel, a director of Unilever, and Mr. E. J. Sterne of Unilever technical division have acted as technical advisers.

A greatly expanding future is foreseen by Joseph Crosfield for sodium and potassium silicates and silicate chemicals in general. In consideration of this view, the company have invested a great deal of money in chemical projects at Warrington, the outstanding example being the synthetic fluid catalyst plant which was erected in 1951 at a cost of about £1½ million: this plant is the only one of its kind in the UK and according to the company has saved the national economy millions of dollars.

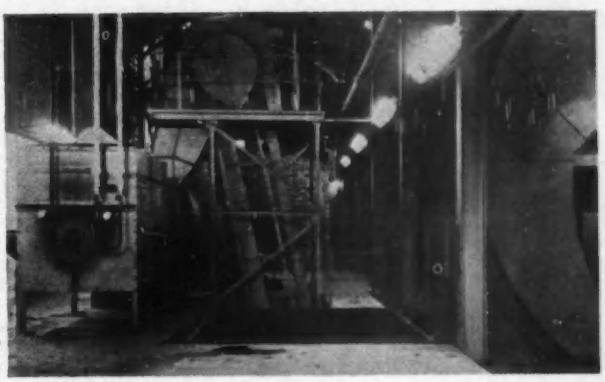
This new furnace at Bow represents another investment well in excess of £300,000. Also work has now started on the re-building programme of the company's Warrington factory which was announced last year. The first part of this scheme is the re-housing of the silicate chemicals department, scheduled for completion in 1960.

Manufacture of silicate glass at the new plant is almost entirely automatic thus reducing materials handling to a minimum. The raw materials, sand and soda ash, are brought in by rail, the sand in 13-ton wagons and the soda ash in covhops each carrying 16 tons.

The sand wagons, lifted bodily by the wagon tipper, discharge their load into a storage hopper. The sand is carried by elevating conveyor into the sand drier—a rotating cylinder with a centre tube through which the products of combustion from an oil-heated furnace are passed. The sand falls on to the tube and moisture is dried out as it passes through. The dry sand falls into a pit from which it is carried by bucket elevators to an overhead conveyor discharging into the sand silo.

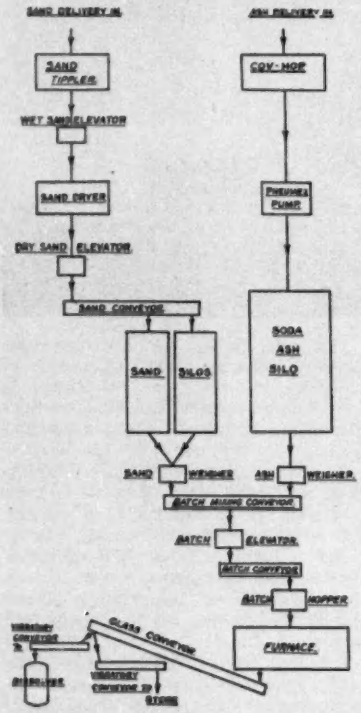
Bulk soda ash is passed through a fully automatic, electro-pneumatic system. The covhop rail wagon is drawn into position so that the outlets are immediately above four pneumatically operated inlet chutes between the lines. The chutes are raised to fit closely round the outlets, the joints being closed by foam rubber washers. When the outlets on the covhop are opened the ash falls into the Fluidor conveyor, consisting of a series of aeration boxes which 'fluidise' the ash so that it flows like liquid into a Pneumex pump which blows it by air pressure into the silo or service hopper.

To prevent caking, a second Fluidor



The sand drier at the new silicate glass plant. On the right is the tipper which lifts sand wagons to discharge their load into the storage hopper. Sand is then conveyed to the cylindrical drier on the left

conveyor draws ash from the silo back into the intake hopper from which it again passes through the pump and is either returned to the silo or blown to the service



Flow diagram for silicate of soda manufacture

hopper. The material is therefore kept almost constantly in motion so that it cannot coalesce.

Wastage is prevented by exhaust air passing through a filter which extracts any soda ash which may be present, returning it to the system. The Fluidor conveyor operates at a pressure of 20-in. water gauge and the Pneumex pump at 40 lb. per sq. in. pressure.

From the two service hoppers, measured amounts of dry sand and soda ash are fed into two Simon automatic weighers which ensure that the correct proportions of the materials are passed to the batch mixer. The mixture is then conveyed by a worm conveyor to a bucket elevator which carries it up to hoppers above the furnace: this feed is automatically controlled and the high and low levels of the mixture in the hoppers are indicated by lights. The mixed sand and soda ash then falls into the batch feeders, the flow being controlled by valves at the base of the hoppers and the batch is conveyed into the furnace by means of the worm conveyor in the batch feeder.

The oil-fired furnace is maintained at an approximate temperature of 1,400°C. to 1,500°C. at which the sand and soda ash are fused forming silicate glass. The molten glass pours over a lip opposite to the charging side of the furnace and falls direct into a bucket conveyor. As the glass travels up this elevating conveyor it cools and solidifies.

From the top of the conveyor solid glass can be routed through three outlets: It can be passed direct to the storage silo; it can be fed on to a vibrating conveyor to which chutes can be fitted at selected points along its length to draw off the glass and direct it through traps to the desired section of the silo; and it can be passed to a second vibrating conveyor which carries it direct to the dissolvers for further processing.

The present chemical sales director of Joseph Crosfield is A. C. H. Cairns who is shortly taking up his new appointment as managing director of Unilever export (see CHEMICAL AGE, 19 October, p. 657); commercial director is R. D. Cameron; technical director, R. Morris; chemical sales manager, S. Yates-Dutton; export manager, A. Melbourne; northern manager, T. H. Hilton; southern manager, D. Sinclair; special products manager, T. Kennedy.

US PLANS LIQUEFIED METHANE SHIPMENTS TO UK

VERY brief details were issued by Sir Harold Smith, chairman of the Gas Council, regarding the first UK shipments of methane to be made in converted insulated tankers. (See CHEMICAL AGE, 5 October, p. 552 and 12 October, p. 592.) From the US, however, comes news that plans are being made by Constock, a company owned by Continental Oil and Chicago Stockyards Co., to have a vessel equipped to ship liquefied methane.

Another US company, Marine Transport, a private shipping company, which operates Dow Chemicals' tankers, have said that they will start converting a vessel at a Mobile, Alabama, shipyard this month from a 6,000-ton ship to a 3,500-ton tanker. The tanker is to be insulated from balsa wood in a vacuum-bottle type construction.

Constock's plans include the eventual operation of 50,000 to 60,000-ton tankers between South American natural gas fields and Great Britain. The tankers will be insulated to hold the −125°F temperature required to maintain methane in liquid form.

It is reported that Constock have spent a great deal in developing processes and equipment. Complications have included: location of gas sources and contracting for supplies at certain prices; establishing facilities for liquefaction of the natural gas of uncertain composition; designing compressors and process facilities; providing tankers requiring special insulation.

Among other US companies active in the field which is believed in the US to be a major and sizeable new industry, are W. R. Grace, with shipping background and South American connections and Air Products Inc., which is believed to be working along similar lines to Constock.

According to two University of Michigan people, P. Lederman and B. Williams, the investment cost of processing transportation and storage will be $239 million (£80 million approximately) to deliver gas at a price of 80 cents per 1,000 cubic feet in Britain. This compares with a price of at least $1 per 1,000 cubic feet for manufactured gas. British engineering costs have been computed at about £40 million for a smaller project to provide London with 200 million cubic feet a day of gas with 500 B.th. u's. per cubic foot. Depreciation and profit are estimated by Lederman and Williams at approximately 50 cents a thousand cubic feet. These figures are based on availability of gas from Venezuela at four to five cents per thousand cubic feet.

Nitrogen Production Surplus

CONSUMPTION of nitrogen for industry is rapidly increasing in all countries. This may prove, the annual review of Aikman (London) states, to be a major solution in disposing of the present surplus capacity. Consumption of nitrogen is still on the increase in Europe, Egypt and the US, and although the percentage has decreased somewhat during the last year, Aikman report that there is every reason to believe that it will increase again in the near future.

Poor crops during the last harvest in the Far East has resulted in a lower consumption than was anticipated, particularly in China, India and Pakistan. Exports have therefore been reduced and foreign exchange available for new imports of nitrogen and other fertilisers has lessened.

In Europe nitrogen production capacity has exceeded the estimated increase and a large surplus is certain during the next few years, unless production is further curtailed by agreement. Normally, Aikman report, much of the surplus would go to the Far East, but in view of the increasing competition from the US and Japan, it is unlikely that these markets will absorb the surplus in the near future.

Production in the US, Aikman point out, has been reduced owing to uneconomic prices and the impossibility of disposing of surplus capacity. It is expected that at the end of this year, US synthetic nitrogen capacity will be about 3.65 million metric tons or 3,825 million metric tons if by-product is included. However, total production for the year 1957-58, the review reports, is unlikely to exceed 2.9 million metric tons in all. Consumption in the US during the same period is estimated at 2.9 million metric tons of which 0.9 million is for industrial and military purposes.

Regarding Japanese production of nitrogen, the Aikman report indicates that production, especially in urea, is increasing. The total for the year ended June 1957 was estimated at 745,000 tons nitrogen. Consumption, including industry, was reported to be 640,000 tons leaving 105,000 tons available for export. Production for 1957-58 is estimated at 860,000 tons and consumption at 660,000 tons, so exports might be 200,000 tons and for 1958-59, 880,000 tons (680,000 for home use and 200,000 tons for export).

CHEMICAL SOURCES OF ROCKET POWER

Possible Soviet Use of Boranes

IT was reported on Monday night that a Soviet scientist had stated that 'new sources of power' were used to project the second Sputnik into space. Academician Dikushin is quoted by Tass as reporting 'The increase in the satellite's size to provide for a large number of measuring and telemetering instruments, and even for an animal passenger, necessitated the development of new, improved instruments and sources of power'.

Last week rocket propellants were considered in CHEMICAL AGE. Now with the launching of a second satellite and the little information about it, speculation is rife regarding the new sources of power. It seems certain that a smaller rocket was used than a three- or four-stage rocket which would weigh 700 tons, and that more advanced rocket fuels have been produced by Russian scientists. In general the opinion is that three types of fuel would have the necessary thrust to send the rocket up to 1,000 miles above the earth. Either compounds based on the light elements boron or lithium might have been used, or monatomic hydrogen. Alternatively some other potentially high energy-producing gaseous compound concentrated by freezing might have been employed.

Combustion Chamber Temperatures

In the following table combustion chamber temperatures are shown of 12 propellant combinations:

Propellant combination	°F.
Nitric acid—ammonia	4,220
Oxygen—hydrogen	4,500
Hydrogen-peroxide—hydrazine ...	4,690
Hydrogen-peroxide—gasoline ...	4,830
Nitric acid—aniline	5,100
Fluorine—hydrogen	5,100
Nitric acid—gasoline	5,150
Oxygen—hydrazine	5,370
Oxygen—alcohol	5,560
Oxygen—gasoline	5,770
Fluorine—ammonia	7,224
Fluorine—hydrazine	7,940

The higher-order combustion temperatures result from the breaking of weak fluorine—fluorine bonds and the formation of stronger hydrogen fluorine, and nitrogen—nitrogen bonds. Even higher combustion temperatures are recorded for liquid oxygen and diborane.

Almost all available reaction products in known present-day rocket engines begin dissociating about 5,000°F. with advanced dissociation levels at 8,000°F. to 10,000°F. There is considered to be little possibility that the flame or kinetic temperature will rise above approximately 10,000°F. Flame temperatures somewhat higher than those listed above (at 500 lb. p.s.i. absolute) may be reached by raising combustion pressure. Chemical reactions in which stable compounds such as carbon monoxide and nitrogen are formed can have progressively higher flame temperatures. In fact, from chemical reactions a flame temperature of 10,600°F. is possible but molecular weight is higher at about 28 than those listed for the more usual fuel combinations (18 to 22). High temperatures and low molecular weights are together required for high specific impulse.

US workers on rocket fuels are known to have considered until recently that the highest rocket performance system for chemical reaction is the system of fluorine and hydrogen with a specific impulse of 373 followed closely by the oxygen-hydrogen system at 364. (500 lb. unit vol/sec.)

Potentially Important

Potentially more important, however, is the rocket fuel diborane with fluorine as an oxidant. Borane occurs in few areas of the world as borax or boric acid namely the US, Russia, Turkey and Tibet and China. It is believed, moreover, that Russian scientists have undertaken considerable development work on boron compounds.

Compared with other suggested fuels, the boron hydrides offer the possibility of much greater energy releases per unit weight of fuel. Thermochemical calculations have shown that the complete reaction of a stoichiometric mixture of a boron hydride and oxygen should release approximately twice as much energy per lb. as an equal weight of a mixture of hydrocarbon and oxygen. This is due to the higher heat of oxidation of boron compared to carbon.

Diborane, B_2H_6 is the simplest stable boron hydride which is a colourless gas at room temperature. It is believed to be in equilibrium with borane BH_3. A boron hydride containing three boron atoms per molecule has never been observed, although salts such as $Na\,B_3\,H_8$ are known. Four colourless liquid boron hydrides are known—tetraborane (B_4H_{10}), pentaborane (B_5H_9), dihydropentaborane (B_5H_{11}), and hexaborane (B_6H_{10}). A heptaborane has never been reported but there is evidence of an octa-and nona-borane. The highest known boron hydride is decaborane ($B_{10}H_{14}$).

Stability is in the following order: $B_{10}H_{14} > B_5H_9 > B_2H_6 > B_5H_{11} > B_4H_{10}$ decomposes at 30°C., B_5H_{11} at 60°C., B_2H_6 at 100°C. and B_5H_9 over 200°C. Decaborane is only slightly decomposed after 48 hours at 200°C.

High temperature techniques are required in the preparation and manipulation of boron hydrides owing to the extreme toxicity of boron hydride vapours and the explosion hazard in the presence of oxygen. Pentaboranes spontaneously ignite in the presence of oxygen while decaborane is explosive if exposed to oxygen above 100°C.

The preparation of diborane is a key synthesis as it is the principle source of higher boron hydrides which can be prepared from diborane by pyrolytic reactions. Diborane can be prepared from borohydrides and BF_3 or from other hydrides that react with BF_3 to form borohydrides in an initial step. These other hydrides can be $LiAlH_4$, LiH, NaH and $LiHB(OCH_3)_3$ which react with BF_3 to form the corresponding borohydride which then reacts with additional BF_3 to form diborane.

Higher boranes are prepared from diborane, in the absence of oxygen and moisture, by condensation reactions that eliminate hydrogen.

As B_4H_{10} and B_5H_{11} are very unstable they have to be prepared by the mildest pyrolytic conditions, namely, relatively low reaction temperatures and short reaction times. Without these precautions, pyrolysis of diborane results in the formation of more stable boron hydrides.

When diborane is allowed to stand at room temperature under high pressure, the principle initial product is tetraborane; after nine days, higher boron hydrides became major products. Tetraborane is, however, more conveniently prepared from dihydropentaborane by heating with an excess of hydrogen at 100°C. for 10 minutes.

Further pyrolysis of these lower boranes leads to the formation of pentaborane and higher boranes. The very stable decaborane is prepared by pyrolysing diborane for longer periods at 160°C., heating only one side of a sealed tube. The decaborane condenses on the cold side thus being effectively removed from the reaction zone and so preventing its further decomposition.

Non-volatile Compounds

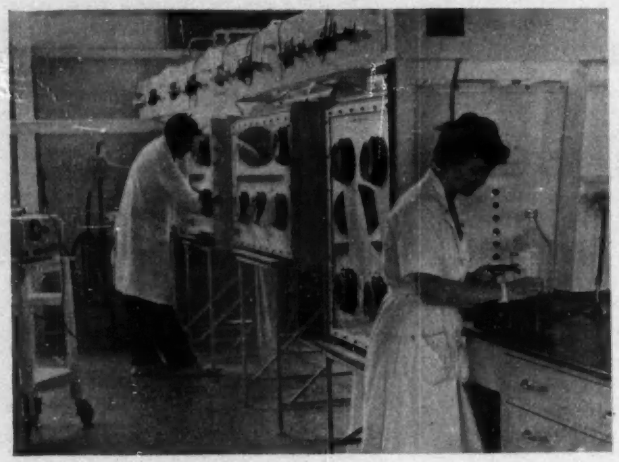
One of the particularly interesting aspects of boron hydride chemistry is the existence of non-volatile substances of boron and hydrogen about which little appears to be known.

Only a small number of boron hydrides have been characterised to date and it is believed that characterisation of these non-volatile substances could have important practical applications, for since they have generally been found to be inert compared to the volatile boranes, they would be safer and, of course, easier to work with.

With regard to the possible identity of these substances, it has been suggested that the most stable boron hydrides would be composed of completed pseudo-spherical polyhedra, of which the most likely stable boron hydride is isocahedron, represented by the hypothetical $B_{12}H_{12}$ molecule and the octahedron represented by B_6H_6.

The most powerful rocket fuel known today is monatomic hydrogen. This is stated to yield a thrust or power of 1,400 lb. per second per lb. of material used, which is four times as powerful as the thrust that is obtained from diborane and liquid oxygen. Difficulties involved in its use is in the production of a stable form, which will remain useful for an adequate period of time. Keeping the material at a very low temperature has been suggested to accomplish this stability.

Laboratory Extensions Opened at Radiochemical Centre



Glove boxes at Amersham used in the beta emitters in the new Laboratories

TWO new buildings were inaugurated last week at the Radiochemical Centre at Amersham by the Marquis of Salisbury. The 12,000 sq. ft. laboratory and the new office block have been built to cater for the increased demand for radiochemicals from Amersham, which has more than trebled during the last three years.

The laboratory will continue the work started in April 1954; the separation of pure radioactive isotopes from materials irradiated in the Atomic Energy Authority's reactors, the synthesis of 'labelled' compounds for research and the manufacture of radiation sources for industrial and medical use.

The standard of radiological safety and control of contamination is high, and special vacuum cabinets and remote control equipment for handling radioactive substances have been installed. A group of 'hot caves' is under construction for processing caesium-137 and strontium-90 and such minor fission products as promethium, cerium-144, yttrium-91, zirconium and niobium-95.

The 'Hot-Caves'

They consist of three connecting compartments which can accommodate activities up to 1,000 curies of caesium-137, the shielding is three feet of high density (155 lb. per cu. ft.) concrete blocks and the vision is through windows containing concentrated zinc bromide solution. Materials within the cells are handled by three pairs of Argonne pattern master-slave manipulators. Each cave is provided with an enclosed metal liner, measuring 7 ft. by 8 ft. by 15 ft. kept under slightly reduced pressure to prevent the escape of radioactive dust, and access for servicing is by the 'captive man suit' technique, a totally enclosed plastics suit with tunnel entrance.

Since the four smaller laboratories were opened in 1954 the scale of production has increased two to three times, and there have been improvements in the quality of the products. The best carbon -14 made recently has been nearly 50 per cent isotopic abundance, as compared with less than 2 per cent three years ago. The dispensary at Amersham now deals with up to 100 consignments a day, and in the last three years some 30,000 dispensings have been made. Although a Government organisation, the Radiochemical Centre operates as a business organisation, and is self-supporting.

It sells radioisotopes to most countries of the world, including the East European nations, and at present has competition only from the US. The number of separate syntheses of labelled compounds (other than C-14) has also risen, from some 200 in 1954 to more than 500 this year, and these incorporate about 20 different isotopes.

Sales of Isotopes

Although at present sales of isotopes for medical purposes exceed sales to industry, the Centre considers that there will be an increasing demand for tracer compounds in chemical technology, particularly in the study of weedkillers, pesticides, fertilisers, rubber additives and detergents.

Gamma emitting isotope sources are already widely used in heavy industry to replace X-ray apparatus for the radiographic detection of cracks in castings, forging and large scale welds. Among the isotopes used for this purpose is caesium -137 which is fabricated into near point sources 2, 4 and 6 mm. diameter.

To reduce fire risks and process difficulties caused by static electricity in, for example, textile and paper mills, beta emitting sources such as thallium-204 or strontium-90 are used. Much stronger sources are being developed for use in the sterilisation of food products and antibiotics.

ICI's and Yorkshire Copper Works's Joint Enterprise

THE boards of the Yorkshire Copper Works Ltd. and Imperial Chemical Industries Ltd. have agreed to combine their activities in the copper and copper alloy tube and plate industry in a joint enterprise on the basis of equal participation. Methods of achieving such a combination are now being explored.

It is stated that ICI would contribute its new copper tube factory at Kirkby, Liverpool, which is one of the most advanced in the world, the Allen Everitt copper and copper alloy tube works at Smethwick, Staffs, the plate factory at the Landore Works, South Wales, and the Fyffe fittings factory at Dundee. The Yorkshire Copper Works Ltd., on the other hand, would contribute its large copper and copper alloy tube and fittings works at Leeds, together with its recently established manufacture of plastics tubes; also the tube factory at Barrhead in Scotland, the shell moulding works at Castleford, known as Anson Units Ltd., and the controlling interest in Yorkshire Fittings (Australia).

Arsenic contributed to Man's Death

AT an inquest at Accrington, Lancs, recently on a 43-year-old chemical worker, Abraham Taylor, employed by William Blythe and Co. Ltd., medical evidence was given that the presence of arsenic had contributed to his death.

Mr. Frank Ashworth, process manager at the works, said that there was no reason why Taylor should have come in contact with sodium arsenite—the substance he was preparing for most of his time at Blythe's. The men were given protective clothing which included masks and there were ample washing facilities. Employees in the department were medically examined about every third week.

The work's doctor, Dr. K. Tuxford, said he noticed the pigmentation of Taylor's skin and a thickening of his palms, but as Taylor was then leaving the arsenic department he did not take any action. He had never come across any connection between arsenic and internal cancer, but there was a connection between arsenic and cirrhosis.

Another medical witness said that there was definite evidence of arsenical poisoning of the skin. The verdict was 'death by misadventure'.

Sonde Place Expansion Schemes

EXTENSIONS now being carried out at the Sonde Place Research Laboratory, Dorking, Surrey, will add about 3,500 sq. ft. to the available area. This will be devoted partly to chemical and chemical engineering research facilities.

However, the greater part of the increased space will be devoted largely to improved workshop facilities made necessary by the increased volume of pilot plant development work. This is the first stage of a development scheme which will double the existing space available in the next two years.

Construction is by Hewitt's of Cranleigh, Surrey, who are specialists in industrial prefabricated clear span buildings.

DETERMINING CONTAMINANTS IN TRADE EFFLUENTS

Main ABCM—SAC Methods Discussed

THE main methods recommended by the ABCM-SAC joint committee for determining inorganic contaminants in trade effluents were the subject of the first meeting of the present session of the Midlands section, Society for Analytical Chemistry held recently in the University, Birmingham, when Mr. N. T. Wilkinson (ICI Ltd., alkali division) discussed 'The determination of some inorganic substances in trade effluents'.

In most instances, determination of metallic constituents of trade effluents had to be preceded by destruction of organic matter by oxidation with nitric and sulphuric acids(1). Certain metals, however, required special treatment.

Two methods(2) had been adopted for determination of arsenic, namely the Guzeit method and the hypophosphite method. It was decided to omit the molybdenum-blue method, since sufficient experience had not been obtained with it yet in this country.

Sodium diethyldithiocarbamate was recommended for determination of copper(2), all common metals, except bismuth, being sequestered with EDTA-citrate solution at pH 8.5. If bismuth was present, the determination had to be repeated in the presence of potassium cyanide. This gave the bismuth content only and copper could be obtained by difference.

Promising New Reagent

Of many reagents recently introduced for determining copper, bis-cyclohexanoneoxalyldihydrazone was extremely promising. This reagent yielded a water-soluble copper complex, and extraction with an organic solvent, as in the case of sodium diethyldithiocarbamate, was unnecessary. This very simple and direct method, Mr. Wilkinson suggested, could eventually replace use of sodium diethyldithiocarbamate.

Iron was best determined colorimetrically using thioglycollic acid(3). This was an excellent method for small amounts of iron, and although the 2:2'-dipyridyl procedure was considered, insufficient experience had been gained to recommend its adoption.

In the method recommended for mercury(3), organic matter was destroyed by a special nitric acid-permanganate treatment under slight pressure. Iron was then suppressed by hydroxylamine, the solution made acid to eliminate other heavy metals, and mercury extracted with toluene as its golden-brown dithizonate, which was determined colorimetrically.

The principle of the method(3) for nickel was its extraction with chloroform from ammoniacal solution as the dimethylglyoxime complex and final colorimetric determination as the nickelic complex.

Two methods(4) were recommended in the case of chromium, one for determination of total chromium and the other for chromium present as chromate. For the latter determination, a direct application of the colorimetric procedure with diphenylcarbazide was advocated. The method was inapplicable when an effluent itself was highly coloured, and chromate tended to disappear in an effluent owing to reduction by organic impurities. The method for total chromium consisted essentially of preliminary oxidation of chromium with potassium permanganate in the presence of phosphoric acid and final oxidation with hydrogen peroxide in caustic alkaline solution. After filtration, chromium, as chromate, was determined colorimetrically as the violet-coloured complex with diphenylcarbazide.

Determining Lead

For determination of lead, the joint committee advised the well-known dithizone method(4), the lead dithizonate was then determined colorimetrically, either instrumentally (up to 100μg) or by visual colour-comparison (up to 15μg).

Two methods had been given for selenium(4), the first, a 'sorting' test to establish presence of selenium in a trade waste and give an approximation of its content, the second, the recommended method of determination. In the 'sorting' test, selenium was reduced by means of either hydrazine sulphate or ascorbic acid to the elemental form, which was measured colorimetrically against standards. For determination of selenium, the latter was distilled as its bromide, which in the aqueous distillate became selenious acid. This was reduced to elemental selenium by means of ascorbic acid and measured colorimetrically against standards.

The well-established potassium periodate method was advocated for determination of manganese. Analysis had to be carried out in a solution containing phosphoric acid. In order to obtain full development of colour, the solution should be maintained at 100°C for one hour by immersion in a boiling water bath. For concentrations of permanganate ion below 0.05mg. per 100ml. in the final solution, visual matching was recommended since this had been found more accurate than using an instrument.

Depending on the amount present in the sample, two methods(5) had been put forward for determining zinc. For zinc contents greater than 5mg. per l., zinc, together with certain other heavy metals, was extracted at pH 4.5 with a solution of dithizone in chloroform. Zinc, together with bismuth and cadmium, was then extracted from the chloroform phase with dilute hydrochloric acid. After evaporation of the acid extract, zinc in the residue was treated with potassium iodide in the presence of potassium ferricyanide. Liberated iodine was subsequently titrated with thiosulphate. This procedure was specific for zinc. For determination of quantities of zinc below 5mg. per l. copper was removed, if necessary, with dithizone at pH 2, and zinc separated from other metals by extraction with dithizone at pH 4.7. Excess of dithizone was removed with sodium sulphide and the zinc dithizonate in carbon tetrachloride then measured colorimetrically.

In the method for aluminium(5), the principle involved was the production at pH 4.4 of a red to pink lake with ammonium aurinetricarboxylate (aluminon), which was determined colorimetrically. Iron was sequestered with thioglycollic acid.

The recommended method for determination of antimony in effluents(6) depended upon preliminary separation of antimony as sulphide, arsenic having been first removed by the hypophosphorous acid procedure. After dissolving the sulphide precipitate in an oxidising medium, antimony was reduced to the trivalent state by sulphur dioxide, then titrated with potassium bromate solution using methyl orange indicator.

A turbidimetric method had been developed for determination of barium as barium sulphate. Organic matter was destroyed by evaporating the sample to dryness and igniting the residue. After extraction of barium from this residue, hydrogen sulphide-metals were precipitated and removed by filtration. Barium sulphate was then precipitated, glycerol being added as a protective colloid. Interference by lead and strontium was virtually eliminated by addition of EDTA.

Method for Cadmium

In the method for cadmium, a colorimetric determination with dithizone was advised. Extraction of cadmium was carried out with dithizone from a caustic alkaline solution containing cyanide, tartrate and hydroxylamine hydrochloride. The method had been shown to give excellent results when determining cadmium in solutions containing antimony, arsenic, zinc, iron, lead, mercury, copper, nickel and chromium.

For determination of sodium and potassium, use of a flame photometer was suggested. In the absence of such an instrument, sodium could be determined by the zinc uranyl acetate procedure and potassium by the cobaltinitrite procedure.

The method for calcium and magnesium(7) consisted of determining calcium separately, then the sum of calcium and magnesium; magnesium was subsequently calculated by difference. The sample was evaporated to dryness and organic matter destroyed by igniting the residue. The residue was brought into solution, neutralised with sodium hydroxide, and calcium determined by titration with EDTA solution using murexide as indicator. For the sum of calcium and magnesium, neutralisation was effected with ammonia and the solution titrated with EDTA solution using Solochrome black WDFD as indicator. In both determinations, barium, which interfered, was

removed as sulphate, and interference from metals such as copper and nickel was overcome by addition of potassium cyanide.

Phosphorus could be present in effluents inorganically, as phosphate in all its forms—ortho, meta, pyro, or poly, or organically combined or as both. The usual colorimetric methods only determined orthophosphate, so that for total phosphate other forms of phosphate must be hydrolysed to the ortho condition. Determination of orthophosphate was based on formation of phosphomolybdate by addition of ammonium molybdate and subsequent reduction to produce a blue colour. This was measured colorimetrically. Excellent results had been obtained with ascorbic acid as reductant(8).

No method had yet been finally recommended for determination of fluoride in effluents. There were, however, both colorimetric and volumetric methods available for determination of fluoride in water and it was suggested that, with slight modification, these methods could be applied to the analysis of effluents.

Determination of cyanide was by the well-known procedure of Aldridge(9). Cyanide and thiocyanate were determined together, and on a separate portion of the sample made slightly acid, cyanide was removed by aeration and thiocyanate determined in the residual solution. Recently, investigations had been carried out to establish conditions under which cyanide could be distilled quantitatively from a solution containing thiocyanate, ferro- and ferricyanides, and cyanides(10).

Silver in Effluents

Further work was to be undertaken by the Society for Analytical Chemistry to investigate and develop a method for traces of silver in effluents. Experiments with an existing procedure(11), depending on precipitation of silver as silver chloride with stannous chloride from hydrochloric acid medium and use of tellurium as collector, followed by dissolution in nitric acid and determination of silver colorimetrically with p-diethylaminobenzylidenerhodanine, had given poor recoveries.

Some of the more important points which emerged from the discussion following Mr. Wilkinson's remarks were as follows.

The joint committee had sought, in the first place, to recommend use of well-established reagents and only instruments which were commonly available in analytical laboratories e.g. an absorptiometer or spectrophotometer.

The work of the various panels was nearly complete and it was hoped to publish the methods in book-form early in 1958. It was emphasised that the book would have no official status in the sense that laboratories concerned with the analysis of effluents were under no obligation to use the methods. Laboratories were only recommended to do so.

After publication of the book, the joint committee was to meet at intervals and consider any criticisms. Constant review of the methods was therefore possible. A future edition might contain procedures using some of the more recently introduced analytical reagents and other instrumental techniques e.g. polarography.

Interpretation of results obtained by recommended methods was not within the terms of reference of the joint committee. Establishment of satisfactory methods of analysis was the starting point for further experimental work to show the significance e.g. on fish, of different constituents of effluents.

REFERENCES

(1) *Analyst*, 1956, **81**, 59.
(2) Ibid., 1956, **81**, 60.
(3) Ibid., 1956, **81**, 176.
(4) Ibid., 1956, **81**, 607.
(5) Ibid., 1957, **82**, 443.
(6) Wilkinson, N. T., *Analyst*, 1953, **78**, 165.
(7) *Analyst*, 1957, **82**, 197.
(8) Wilkinson, N. T., to be published.
(9) Aldridge, W. N., *Analyst*, 1944, **69**, 262, and 1945, **70**, 474.
(10) Wilkinson, N. T., to be published.
(11) Sandell, E. B., and Neumayer, J. J., *Analyt. Chem.*, 1951, **23**, 1863.

Disc Chromatography for Leguminous Alkaloids and other Bases

PAPER chromatograms using a technique of discchromatography have been found of great value in indicating the nature of alkaloid mixtures such as are found in many leguminous plants. Applications of the technique are described by E. P. White (*N. Zealand J. Sci. and Technol.*, 1957, **38**, No. 7, 707).

Whatman No. 1 paper discs, 24 cm. diameter are used. A circle 3 cm. diameter is marked in pencil at the centre, and 6 or more spots are pencilled around the circumference of the circle. A nick 5 mm. wide and 2.5 cm. long is cut radially from the centre and folded downwards at right-angles to the plane of the paper. Spots of from 1 to 20 μg. of alkaloids as hydrochloride or acetate in water, or appropriate dilute acid, or as bases in chloroform, are applied at the marked positions, spots being kept small by repeated additions when necessary.

The paper is laid over the bottom part of a vacuum desiccator, 15 cm. internal diameter, and consisting of approximately equal top and bottom parts. The circumference of the filter paper is outside the desiccator when the latter is closed. Solvent is placed in a Petrie dish so that the surface is 2.0 cm. below the level of the paper, the nick extending into the solvent. The lid is replaced and the chromatogram is allowed to develop at 26 $\pm$ 2°C. When the solvent front approaches the sides of the desiccator, the paper is removed, the solvent front marked, and the paper dried for a few minutes at 60°C. in an oven. It is then sprayed with diluted potassium bismuth iodide reagent (generally the modified reagent using acetic acid.)

It is stated that the technique proved of particular value in providing evidence of homogeneity of new bases. In a few instances the Rf value of a base in the presence of another was lowered appreciably, e.g. retamine in the presence of sparteine dropped from 0.52 to 0.46, sparteine in the presence of lupanine from 0.64 to 0.57.

With the disc system cystisine, methyl cystisine and anagyrine at 26°C. give values of 0.21, 0.51 and 0.60 respectively compared with Rf values at 20°C. using paper sheets, of 0.08, 0.31 and 0.45, respectively.

Under prescribed conditions Rf values could generally be repeated within $\pm$ 0.02 with solvent A-butanol phase of *n*-butanol 'Baker's Analysed' 50 ml., water 17 ml. Hll 36 per cent 7.5 ml.—development time 13 to 15 hours, or with solvent B-butanol phase of the same *n*-butanol 50 ml., water 17 ml., glacial acetic acid 2.0 ml.—development time, eight hours. Solvent A serves to distinguish bases such as nicotine, tubocurarine, cholines, betaine, mescaline, arecoline, cinchonidine, aliphatic di-and tri-amines, novocaine, pyridine, and quinoline bases, pyrrolidine and purine alkaloids.

Generally, White states, Rf values of acetates with solvent B parallel those of hydrochlorides with solvent A, but are lower. Rf values of the free bases with solvent C-butanol phase of the same *n*-butanol 50 ml., water 15 ml. (development time, 8 to 8.5 hours)—are generally quite different from those of the salts in the acidified solvents, and serve to distinguish many bases.

Using Whatman No. 3 paper 32 cm. diameter in a larger desiccator, as much as 100 mg. of mixed leguminous alkaloids applied in a ring of 3 cm. diameter were separated in some instances, using solvent A (11 cm. radial movement in 30 hours). Radial strips were stained to locate alkaloid bands, and the unstained parts cut out.

*Iso*cinchomeronic Acid, a Useful Intermediate

Now being offered by Ausul Chemical Co., Marinette, Wisconsin, US, on a commercial basis is *iso*cinchomeronic acid. This chemical is suggested as an intermediate in the preparation of pharmaceuticals, insecticides, polymers, and dyestuffs.

The company state that *iso*cinchomeronic acid is a light tan to yellow powder of molecular weight 167.12. Melting point is approximately 236°C. (decomposes) and a neutralisation equivalent of 83.56 (pure material). Purity is about 95 per cent. It has no free water, contains less than 1 per cent *iso*cinchomeronic acid monohydrate and less than 5 per cent of non-acidic impurities.

Small samples are available from the company without charge.

Progress of Plastics

Fourth young people's lecture of the Plastics Institute will be given by Professor C. E. H. Bawn, professor of inorganic and physical chemistry, Liverpool University, in the William Beveridge Memorial Hall, Senate House, London University, on 2 January at 2.30 p.m. His subject will be 'The progress of plastics'. Tickets can be obtained from the Institute, 6 Mandeville Place, London W1.

Overseas News

SLIGHT DROP IN AUSTRALIA'S SULPHURIC ACID PRODUCTION

SULPHURIC acid executive committee, Department of Defence Production, Commonwealth of Australia, has recently released the following production statistics for the quarter ended 30 June 1957 and for the full year to 30 June 1957.

Sulphuric Acid Production

Acid production (mono-tons)	Quarter ended 30/6/57	Year ended 30/6/56	Year ended 30/6/57
ex Brimstone	132,654	544,666	438,783
ex Pyrites	77,846	236,433	276,508
ex Zinc concentrate	25,939	80,341	98,648
ex Spent oxide	3,430	15,365	12,641
ex Other materials	15,065	27,697	57,219
Process—Chamber	150,091	554,844	501,874
Contracts	104,834	349,658	381,925
Total production	254,925	904,502	883,799

Raw Materials Used For Acid Manufacture (tons)

Acid production (mono-tons)	Quarter ended 30/6/57	Year ended 30/6/56	Year ended 30/6/57
Brimstone	45,446	185,292	148,324
Pyrites	65,369	195,422	227,608
Zinc concentrate	33,244	102,914	128,489
Spent oxide	3,532	15,835	12,839
Other materials	65,403	112,271	264,032

Analysis of Brimstone Consumption (tons)

	Quarter ended 30/6/57	Year ended 30/6/56	Year ended 30/6/57
For acid manufacture	45,446	185,292	148,324
For other uses	1,595	9,694	9,331
Superphosphate (tons)			
Made	592,002	2,125,803	1,961,008
Sold	689,108	1,968,445	2,054,097

Naphtachimie Plant Increases Throughput

Manufacture of petroleum chemicals at the Naphtachimie plant near Lavera refinery, Marseilles, France, has been increased by the enlargement of the cracking plant which can now produce 18,000 tons a year of ethylene compared with 10,000 tons previously.

Naphtachimie was commissioned in 1953 for the production of petroleum chemicals derived from feedstocks supplied by Lavera refinery, which is operated by Société Française des Petroles BP. This company also has a substantial holding in the Naphtachimie plant.

Dutch Factory's Chemical Production Programme

Further information regarding the news item in CHEMICAL AGE, 26 October, p.690, indicates that of the total production of sulphuric acid produced by Koniinklijke Zwavelzuurfabriken v/h Ketjen, Amsterdam, one-half is exported. Other Ketjen products are exported to a very considerable extent.

The actual production of Ketjen is as follows: battery acid, chloramine, chlorosulphonic acid, disulphurisation catalyst, diochylphthalate, di-iso-octylphthalate, diphenylolpropane monohydrate, m.s. fluid cracking catalyst, m.s. hydroforming catalyst, oleum, orthotoluene sulphonamide, p-toluene sulphochloride, p-toluene sulphonamide, potassium permanganate, saccharin, sulphur dioxide liquid, sulphuric acid 66°Be, 60°Be chemically pure.

US Unclassified Notes on Titanium in Missiles

Details of titanium and titanium and stainless steel alloys used by North American Aviation, responsible for the now abandoned Navaho long-range missile project have recently been unclassified. Titanium and the above-mentioned alloys are stated to have been found unsuitable for the construction of the skin, or outer casing of the missile.

In the case of the first US guided missile, however, the use of titanium for a gyroscopic guidance control unit, which involved the high-speed spinning of a gyroscope wheel inside a corrosive liquid, was stated to be a great advantage owing to its low expansion rate and heat conduction. The information released suggests that titanium and titanium alloys are concerned in the construction of internal parts such as in shields for the power units.

Sulphur Recovery at Lacq

Monthly output of recovered sulphur at Lacq, by Société Nationale des Petroles D'Aquitaine is now reported as being about 5,000 tons. The brimstone is of 99.95 per cent purity. As construction work on the second stage of the gas cleaning and sulphur recovery installation is on schedule, total capacity of 300,000 tons of sulphur may be expected to come on stream by the latter half of 1958.

New US Butadiene Plant on Stream

At the end of last month, Odessa Butadiene's $22 million plant in West Texas, US, went on stream. It has an annual capacity of 50,000 tons of butadiene. Of this amount, 32,000 tons is destined to be piped to General Tire and Rubber Co., and the remainder to a butadiene/styrene synthetic rubber plant operated by United Rubber and Chemical, subsidiary of United Carbon.

The Hondry process is used by Odessa to dehydrogenate *n*-butane. Eight reactors in use permit a cycle time of 18¾ minutes. Cuprous ammonium acetate purification of butadiene is used.

German Sulphur Production

Recovered sulphur output in Western Germany in 1956 totalled 78,364 metric tons. Sources of the sulphur were: the extraction of elemental sulphur from spent oxide by means of carbon disulphide and in some cases trichloroethylene (21,192 tons); wet purification of coke-oven gases by way of hydrogen sulphide and Claus kiln treatment (15,143 tons); and the balance from hydrogen sulphide contained in oil refinery gases from which it is extracted by the amine process and converted to the elemental form in Claus kilns. As much as 46.2 per cent is obtained from coal gas, the largest tonnage so recovered in the free world (*Sulphur*, 1957, No. 18 (September), 39).

Indian Expansion of Chemical Plant

The Indian Government has issued licences to several companies for the establishment or expansion of chemical plant. They include Khan Bahadur H. M., D. H. Bhiwandiwalla and Co., Uran, Kolaba, Bombay, who are to build a plant for soda ash production with a 66,000-ton a year capacity, and a 16,500-ton caustic soda plant. West India Chemicals (Private) Ltd., Kharadi Post, Mundhwa Taluka Haveli, Poona, are to extend their superphosphate production to a capacity of 10,800 tons a year, and Exel Industries, Jogeswari, Bombay 14, are to produce 30 tons of liquid sulphur dioxide a year.

Travancore Electro Chemical Industries, P.O. Chingavanam, Kottayam, will manufacture 810 tons of calcium carbide a month and Atul Products Ltd., Bulsar, Bombay, are to produce 625 tons of sulphuric acid a year. One hundred and twenty tons of sodium bicarbonate a year is to be produced at the Dhangadhra Chemical Works, Bombay, and Tata Chemicals Ltd., Mithapur P.O., Okhamandal, Bombay, will manufacture 4½ tons of ethylene dibromide (trade name Diwali Brand) a year.

Italy's Production of Chromium Derivatives

According to the figures supplied by the Italian Chemical Association, the following quantities of chromium derivatives are manufactured yearly in Italy: Chromic acid 900 tons, sodium bichromate 5,000 tons, potassium bichromate 250 tons, basic chromium salts 1,200 tons, chrome potassium alum 200 tons, and chromium sesquioxide and hydrate 100 tons. The factories engaged in the production of these chemical substances are: Approvvigionamenti Industr. Chimici, Turin (chromic acid only), Montecatini, Spinetta Marengo, and Stoppani, Cogoleto, near Genoa.

Except for chromic acid, home production does not cover the needs of the country and considerable quantities of chromium derivatives have to be imported as shown by the 1956 figures given below:

	Exports tons	Imports tons
chromic acid	84	21
sodium bichromate	109	954
potassium bichromate	190	955
basic chromium salts	14	884
chrome potassium alum ...	5	379
chromium sesquioxide and hydrate	1	160

Most of the imported materials come from West Germany.

Vapour Detector for Carbon Tetrachloride

Preliminary investigations by a General Electric (US) engineering medical team with the General Electric halogen leak detector indicate that medical detection of carbon tetrachloride poisoning may be greatly improved. The detector can detect, it is claimed, carbon tetrachloride in the

human system more than an hour after exposure to relatively small amounts of carbon tetrachloride vapours.

A quantitative measurement of the gas present is obtained with the detector as well as a qualitative detection. According to Dr. J. W. Blenins, plant physician to GEC, of the US, the instrument is very valuable to the industrial hygienist for monitoring areas where toxic halogen gases may be used. The instrument is used primarily, however, to locate leaks in tightly sealed industrial systems such as refrigerator and air-conditioner units. Leaks so small that only one ounce of gas would leak through the opening in 100 years, can be located, it is claimed.

US—Italian Chemicals Agreement

The Italian companies of Rumianca, S.p.A. of Turin and Societa' Italiana Squibb of Rome, have signed an agreement with Olin Mathieson, US. They are to construct a plant for the production of triplephosphates, used in the manufacture of detergents, near Rome. A recently discovered sulphur bed near the site will be utilised for the supply of sulphuric acid necessary to the process. Output is expected to be 30,000 tons a year.

It is also reported that Mr. T. S. Nichols, president of Olin Mathieson, is to join the board of Rumianca in order to facilitate co-operation between the two companies in the production of other chemicals.

New Unit for Oil-Treated Sulphur

A major new unit has been completed by Stauffer Chemicals Inc. US, at Monongahela, Pennsylvania, to make oil-treated sulphur. The product, to be marketed under the trade name Crystex, makes use of a specially developed oil which is stated to be compatible with all types of rubber.

US Monsanto to Build Urea Plant

Monsanto are to build a urea plant at their El Dorado, Arkansas, works. This, the company's first plant, which will make 100 tons a day in prill and solution form, and should be on stream by autumn 1958. The urea can also be used in Monsanto's urea formaldehyde resin.

New Metallurgical Process

A new process for commercial scale production of high purity metals has been developed jointly by Stauffer Chemical, Mallory-Sharon and Temescal Metallurgical in the US. The process involves electron bombardment which melts ingots in high vacuum (about 0.1 micron) removing volatile impurities.

It is believed that the process will be used for commercial production of high purity ductile niobium which up to now has been produced only on a laboratory scale by solid state sintering.

New Polymers of Ethylene Oxide

A series of water-soluble, high-molecular-weight polymers of ethylene oxide have been developed by Union Carbide US. It is stated that these new plastics materials can be cast, calendered or extruded into tough, flexible films. They also have great thickening power. The company plan to have a plant operating by 1960. Development price at present is $1.50 a lb. Eventually the price should be 35 cents per lb.

Molybdenum in Sardinia

A molybdenum-ore bed has been found in Sardinia. It is estimated that it contains about 10,000 tons of mineral, but its metallic content has not been reported yet.

Du Pont's Acetal Resin Plant

At a large-scale plant to be built near Parkersburg, W. Virginia, Du Pont will manufacture a new plastics material, Delrin acetal resin. Commercial production is due by the middle of 1959.

Subject of a Du Pont patent, Delrin is produced from formaldehyde as the basic raw material which is reacted to form a stable polymer of high crystallinity. It is stated that the new plastics material is odourless, is white and opaque but can be compounded in a wide range of colours. By virtue of a hard smooth surface, the new product is suggested as making a good bearing material without lubrication. Other claims for this plastics material are that it is tough, rigid material, with high tensile strength, high melting temperature, dimensional stability, and resistance to deformation under stress.

Engineering applications are suggested for Delrin. Field tests where the material has been required to retain its properties under conditions of high temperatures or humidity, during an extended time under stress, or exposure to many solvents, are stated to have been performed beyond expectations.

Endrin Believed to Increase Cotton Yield

Experiments carried out in Rhodesia and Nyasaland on the use of endrin insecticide may double the output of cotton in Rhodesia and in other parts of Africa, said a spokesman of the Cotton Industries Board recently.

Results so far indicate that if certain insect pests can be kept under control, the average yield of cotton could be increased from 300 or 400 to 700 or 800 lb. an acre. The higher yield would more than pay for the insecticide and the labour to apply it.

US Company Sets Up New Plants for Ethylene Oxide

THE ninth and tenth ethylene oxide plants designed and engineered by Scientific Design Co. Inc., US, are to be set up for Jefferson Chemical Company Inc., and Marles-Kuhlmann (France). Three are in the US, one in Germany, three in France, one in Belgium, one in Japan and one undisclosed. The following ethylene oxide plants have been or are being designed by Scientific Design. Naphtachimie, Lavera, France, two plants; Allied Chemical and Dye Corp. nitrogen division, Orange, Texas; Société Chimique des Derives du Petrole, Antwerp, Belgium; General Aniline and Film Corp., Linden, NJ; Mitsui Petrochemical Industries Ltd., Iwakuni City, Japan; Farbenfabriken Bayer, Leverkusen, Germany; and one undisclosed.

Jefferson Chemical's plant, to be built at Port Neches, Texas, will produce 60 million lb. a year. Marles-Kuhlmann's plant at Gonfreville (near Le Havre) will produce 17 million lb. a year. Both plants are scheduled to go on stream in 1958.

Scientific Design will also manufacture the patented silver catalyst, used in the process, for a number of its licensees. This is a new activity for the company and extends its responsibility one step further. Up until now Scientific Design has designed and engineered plants, trained personnel, supervised start-up and initial production and assumed complete process responsibility. Through its subsidiary, Scientific Design Plants, Inc. it also builds plants and is currently completing the erecting of a 10-million lb. a year ethylene oxide plant for General Aniline and Film Corp., at Linden, NJ.

The ethylene oxide plant will be an important unit in Jefferson's large expansion programme at Port Neches. Production of ethylene will be tripled and ethylene oxide will be doubled. Jefferson has been and will continue to be a substantial producer of ethylene oxide by the chlorohydrin process which uses chlorine. When the new direct air oxidation plant is on stream, Jefferson will be one of the few large suppliers of ethylene oxide to produce by both the chlorohydrin and direct air oxidation processes. Ethylene glycol will be one of the chief end products to be made with Jefferson's ethylene oxide.

Marles-Kuhlmann was formed in 1927 by Etablissements Kuhlmann, (one of France's major chemical companies) and Les Mines de Marles, (a coal mining company). After nationalisation of the coal mining industry, Les Mines de Marles became the property of Les Houillères du Bassin du Nord et du Pas-de-Calais. Marles-Kuhlmann is owned equally by Kuhlmann and Houillères du Bassin du Nord and is operated under Kuhlmann's management.

The new plant will be Marles-Kuhlmann's second one. The first is located at Chocques near Béthune and manufactures derivatives of ethylene and propylene as well as sulphuric acid and ammonia.

Ethylene feed for the new plant will be supplied from an adjacent refinery to be built and operated by Compagnie Francaise de Raffinage.

Total annual capacity of the ten ethylene oxide plants designed by Scientific Design based on the SD process is 241 million lb. which is more than 50 per cent of the total production of ethylene oxide in 1950 (433 million lb.). Present production is estimated to be close to one billion lb. a year.

ANIC BUILD SYNTHETIC RUBBER AND FERTILISER PLANT

Philips Copolymer Process at Ravenna

SMALL-SCALE production of synthetic rubber will be started before the end of the year at the factory which ANIC, a company affiliated with ENI, are building at Ravenna, Italy. The new plant will manufacture GR-S synthetic rubber, on licence from Philips Petroleum Co. of the US, utilising methane and air as raw materials, writes our Rome correspondent.

Several hundred million cubic metres of methane and a still larger quantity of air will be consumed yearly to produce 50,000 tons of acetylene. Firstly, air will be split into oxygen and nitrogen in a Linde plant. The resulting oxygen, mixed with methane, will be subjected to a special process worked out by the Union Carbide Corporation, which will yield a gas consisting mainly of acetylene, hydrogen, and carbon monoxide. This process has been used successfully for five years by the US company at its plant in Texas City. ANIC have obtained a licence to use it and the two companies have signed an agreement whereby their research departments will exchange freely information on improvements that either may develop.

The acetylene obtained by this process, will be utilised for the production of acetaldehyde. A plant with a daily capacity of over 200 tons will be reserved for this purpose. The catalytic process used at this plant has been worked out by Wacker-chemie.

Butadiene and By-Products

In another plant, the acetaldehyde produced will be reduced partially to ethyl alcohol, and the resulting mixture of ethyl alcohol and acetaldehyde will be subjected to a catalytic process that will yield butadiene and various by-products of considerable commercial value. The potential of this plant is about 80 tons a day.

The butadiene produced will be used for the production of synthetic rubber in a copolymerisation plant devised by Philips Petroleum Co. This plant has been designed with an initial capacity of 35,000 tons a year, and later it will be expanded to produce about 55,000 tons a year. The process adopted requires styrene as well as butadiene. To start with, ANIC will purchase styrol from other factories, but before the end of 1958, a special plant will be built to produce styrene on the spot.

This method of producing synthetic rubber will, of course, release large quantities of hydrogen, nitrogen, and carbon monoxide. These residue gases will be used for the production of over 20 tons a day of synthetic ammonia which, in turn, will be transformed into nitric acid, ammonium nitrate, and ammonium sulphate, and used for the production of nitrogen fertilisers at the rate of about 650,000 tons a year.

The final stages of ANIC's programme include the manufacture of urea and compound fertilisers.

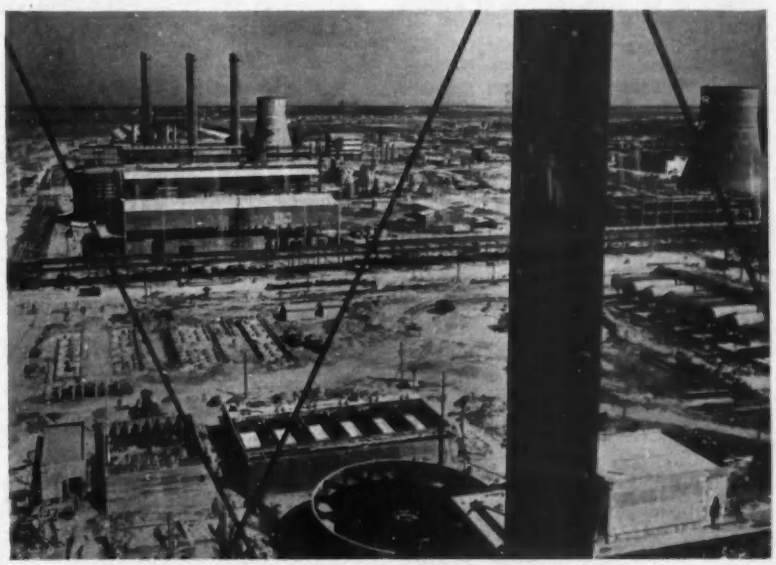
The new factory will have a methane-driven electric power station. The three turbo-alternators of this station total over 100,000 kW. which will be more than sufficient for the needs of the factory. The steam plant, consisting of three boilers, will be able to yield 300 tons of steam an hour (pressure 120 atmospheres, temperature 530°C.).

To ensure an adequate supply of water, a pumping control has been provided. It will draw water from the nearby Reno River at the rate of 4,000 or 5,000 tons an hour. The new factory occupies an area of 524 acres nearly 40 of which are covered by buildings. There are 10 miles of roads and 16 miles of piping.

The plant will cost about 60 milliard lire (£34.2 million) and it will give employment to 2,500 or 3,000 persons.

At present Italy consumes about 15,000 tons of synthetic rubber a year and, thus, a substantial portion of the output of the new factory will have to be exported. No difficulty is, however, expected in this connection. The cost of methane is low to ANIC (who belong to the producing group) and there are no rivals in Europe except West Germany, which produces only 11,000 tons a year.

A number of Italian specialists have been expressing a fear that ANIC's 650,000 tons of chemical fertilisers will prove a drag on the market. The directors of ANIC, however, point out that Italian consumption of such fertilisers (10 kg. per hectare) is still so low in comparison with that in the Netherlands (69 kg. per hectare), Belgium (51 kg. per hectare), or Germany (31 kg. per hectare), that there is plenty of room for improvement. As the new factory will be able to turn out low-priced types of fertilisers, it is considered there will be an extensive market for them.



The synthetic rubber and chemical fertilisers factory at Ravenna, Italy

'More Economical to Burn Coal Tar as a Fuel'

THE decision to build oil refineries in the UK and to import the crude oil had not been without its effects on the uses in which tar and benzole were engaged. This was stated by Mr. R. C. E. Trewhitt, chairman of the northern section, Coke Oven Managers' Association, in his recent inaugural address.

He said that the demand for both products was high but the development of a large chemical industry based on oil products together with the increased price of coal, had meant that it was proving economical to burn coal tar and its products as a fuel with certain processes rather than to expand to any great extent the chemical industry based on coal tar products which at one time appeared to be a lucrative possibility.

As far as ammonia was concerned, the bulk of it was still recovered in the form of sulphate and it was becoming evident that most plants were now able to produce the material in grade one quality.

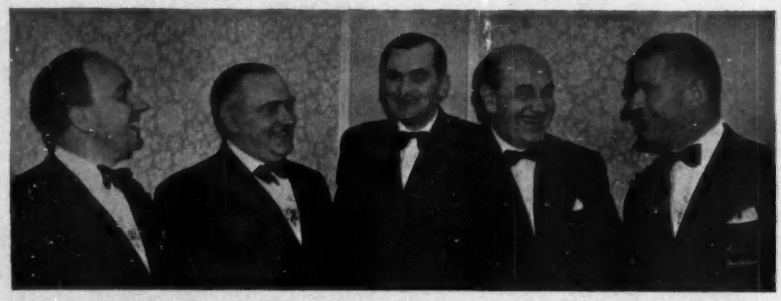
Copper Sulphate for Electroplating Standard

A NEW British Standard specification for copper sulphate—the tenth in a series devoted to chemicals used in electroplating—has been issued (B.S. 2867:1957).

Requirements are specified for chemical composition of the crystals; and the extent of the permissible impurities is laid down. The standard contains a recommendation that, wherever possible, British Standard laboratory glassware be used when carrying out the tests specified in the appendices.

Copies of this standard are obtainable from the British Standards Institution, Sales Branch, 2 Park Street, W1, price 3s.

'Chemical Industry Will Make Big Contribution to Packaging'



Taken at the annual dinner of the north-western area group of the Institute of Packaging are l. to r., V. Gordon-Saker (national vice-chairman of the institute), C. Paine (ICI), B. T. Ledger (Manchester branch chairman), S. Tyrer (chairman, north-western area) and E. G. Whitaker (Unilever Ltd.)

ADDRESSING the first annual dinner of the north-western area, Institute of Packaging, in Manchester, recently, the chief guest, Mr. Clifford Paine, president of the Society of Dyers and Colourists and a director of Imperial Chemical Industries Ltd., said that British goods would not only be measured by their price, their quality and suitability for various functions, but also their attractiveness and presentation to the consumer.

'If we find ourselves facing the challenge—the challenge which to me it is desirable to stimulate—of the European free trade area, then the importance of good presentation of products will not diminish but greatly increase,' he said.

'The Institute of Packaging has a great part to play in this sort of picture.'

In recent years the chemical industry had spent a lot of time and research in improving the physical form of its heavy products, not only to assist the consumer in their use, but also to assist the packaging industry and packaging machinery in handling them.

The chemical industry, too, had made a great contribution over the years to packaging materials. For example, about 30 to 40 per cent of the very large production of polythene went into the production of film, and of that production of film, a large proportion went into the packaging business.

'There is not the slightest doubt in my mind that the chemical industry will make a big future contribution to packaging materials and facilities,' Mr. Paine added.

RIC London Section's Annual Dinner

MUCH attention must be paid in this country to the administration of science. That was stated by Professor P. M. S. Blackett, chief guest at the annual dinner-dance of the London section, Royal Institute of Chemistry, held at St. Ermin's Hotel, London, on 1 November. The dinner, attended by about 150 members, ladies and guests, was presided over by the section chairman, Dr. C. C. Hall.

Professor Blackett was replying to the toast of 'The Guests'. He said that Britain had a good record in the realm of science, but that there were a few lapses in the way it was organised. The problems of organisation were extremely great. It was not sufficient to have good scientists; their efforts had to be canalised into the work that was required and at the right time.

The toast was proposed by Dr. Hall who spoke of Professor Blackett as one of Britain's greatest physicists.

Dr. Hall also proposed the toast of 'The Royal Institute of Chemistry'. Professor W. Wardlaw, president, responded; his remarks are reported by Alembic on page 756. After the speeches, Professor Wardlaw stated that on behalf of RIC members he had sent their warmest congratulations to Sir Alexander Todd on the great honour he had gained with the award of the Nobel Prize for Chemistry.

Instrument Symposium in 1959

The Institution of Chemical Engineers, the Society of Instrument Technology, and the British Computer Society are jointly organising a symposium on 'Instrumentation and computation in process development and plant design', in London in the summer of 1959. Enquiries should be sent to the Institution, 16 Belgrave Square, London SW1.

8 Per Cent Increase in Sulphuric Acid Consumption

COMPARED with the same period of 1956, consumption of sulphuric acid for the quarter ended 30 September increased from 512,613 tons to 553,738 tons (8 per cent). These figures, published by the National Sulphuric Acid Association Ltd., also show that the pattern of consumption between the various sections of the trade has in some cases seen significant changes.

CONSUMPTION

1 July — 30 September

Trade uses	Tons 100% H_2SO_4 1956	1957
Accumulators	2,329	2,806
Agricultural purposes	5,330	3,667
Bromine	3,016	2,456
Clays (fuller's earth, etc.)	2,448	2,386
Copper pickling	766	596
Dealers	2,798	2,804
Dichromate and chromic acid	3,579	4,703
Drugs and fine chemicals	3,810	4,451
Dyestuffs and intermediates	17,538	20,903
Explosives	4,131	3,256
Export	926	1,232
Glue, gelatine and size	108	127
Hydrochloric acid	14,309	13,924
Hydrofluoric acid	3,012	2,051
Iron pickling (inc. tin plate)	27,355	29,997
Leather	1,130	1,175
Lithopone	3,251	2,758
Metal extraction	827	821
Oil refining and petroleum products	15,306	14,705
Oils (vegetable)	1,921	2,022
Paper, etc.	1,443	1,289
Phosphates (industrial)	82	157
Plastics, not otherwise classified	8,758	7,147
Rayon and transparent paper	63,408	66,014
Sewage	2,377	2,380
Soap, glycerine and detergents	18,063	26,456
Sugar refining	130	135
Sulphate of ammonia	69,663	75,073
Sulphates of copper, nickel, etc.	5,929	4,841
Sulphate of magnesium	286	331
Superphosphates	105,001	113,222
Tar and benzole	5,894	7,876
Textile uses	4,354	2,764
Titanium dioxide	67,331	79,536
Unclassified	46,004	49,677
Total	512,613	553,738

Note.—These summaries exclude all Government plants.

SULPHURIC ACID & OLEUM

(Tons of 100% H_2SO_4)

	Chamber and tower only	Contact only	Chamber, tower and contact
Stock, 1 July	26,559	79,543	106,102
Production	113,911	431,917	545,828
Receipts	19,376	50,382	69,758
Oleum feed	—	1,100	1,100
Adjustments	—115	—88	—203
Use	71,566	250,566	322,132
Despatches	61,840	234,119	295,959
Stock, 30 Sept.	26,325	78,169	104,494
Total capacity represented	179,160	518,880	698,040
Percentage production	63.6	83.2	78.2

RAW MATERIALS

(Tons)

	Pyrites	Spent oxide	Sulphur: Imported	Sulphur: Recovered, H_2S and filter cake	Zinc concentrates	Anhydrite
Stock, 1 July	209,110	116,340	73,998	10,435	70,856	18,059
Receipts	103,516	59,738	75,990	12,698	56,271	182,420
Adjustment	+72	+605	+17	—52	—9	—
Use	85,931	58,898	65,890	11,387	36,147	183,607
Despatches*	1,764	2,886	145	77	—	—
Stock, 30 Sept.	225,003	114,899	83,970	11,617	90,971	16,872

*Including uses for purposes other than sulphuric acid manufacture.

EQUIPMENT REVIEW

Chemical Plant: Laboratory Apparatus Safety and Anti-Corrosion Products

INDUSTRIAL LUBRICATION EQUIPMENT

CENTRALISED lubrication for machinery and vehicles is provided by the Multiminor, introduced by Centralube Ltd., Great Western Trading Estate, Park Royal Road, London NW10. It is a small lubricator designed for use with grease or oil, and one to eight points can be lubricated by a single movement of the lever. The internal piston feeding each point in succession is designed so that the lubricant cannot be fed to an outlet until discharge to the previous outlet has taken place.

The lubricator, which has a de-aerating screw to prevent air locks and a locking bracket for the lever, has a retail price of 10 guineas.

ELECTRICAL ACTUATOR FOR VALVES

VALVES produced by the Audley Engineering Co. Ltd., Newport, Shropshire, are now available with an integrally mounted electrical actuator. Known as the Rotork actuator, it has torque limiting protection for opening and closing, an emergency hand operation, and an integral switch box for ancillary circuits.

High-grade cast iron and malleable iron are used for the actuator body and housing. The actuator worm wheel is of aluminium bronze and the worm of high carbon steel. All external components are chrome or cadmium plated.

TORSION BALANCE FOR SURFACE TENSION

SURFACE tension determination of clear liquids and soap solutions can be effected by a new torsion balance produced by White Electrical Instrument Co., 10 Amwell Street, London EC1. The instrument can also be used for the measurement and comparison of masses, electrostatic and electromagnetic forces or as a simple extensiometer.

The sensitivity of the balance is dependent on the physical constants of the torsion wire and it is such that with a load of one gramme in the pan a deflection of 10 millimetres is obtained. The instrument costs £3.

STAINLESS STEEL WELDED TUBES

THE production of stainless steel welded tubes and fittings has been started by the Talbot Stead Tube Co. Ltd., Green Lane, Walsall. The first runs will be in Metior 1 (18/8) quality. These fittings are made in three ranges: Whitworth thread, rubber ring joint to BS 1864/52; Acme thread, cone seat union to the US 3-A specification; 2 start 4 TPI Whitworth thread, tongued rubber gasket joint (CB/TS).

The complete range of fittings includes unions, blank caps, plug cocks, tees, bends, reducing bends and liners. They are available in six sizes, 1 in., 1¼ in., 1½ in., 2 in., 2½ in., and 3 in. The expanding tube fitting is said to give a leak-proof joint of remarkable strength and is designed to be removed with a special type of puller which enables the liners to be pulled off undamaged and ready for expansion on to another tube.

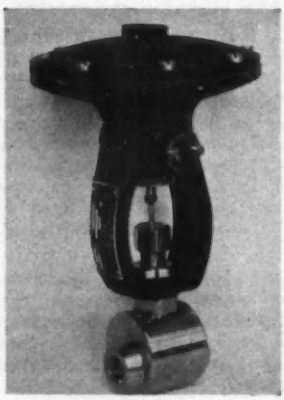
The company is also supplying drawn welded tubing. Maximum size for welded tubes will be 1¼ in. o.d. at present and thicknesses will be between 18 and 14 gauge. Talbot Stead expect to be able to offer their Metior 2 (18/8/Ti) and Metior 6 (18/8/Mo) qualities in the near future.

CONTROL VALVE FOR SMALL FLOWS

THE Masoneilan type 107/108 diaphragm-operated control valve for exceptionally low capacity applications, is now being made by the Crosby Valve and Engineering Co. Ltd., Wembley, Middx.

This valve, particularly useful for pilot plant and dosing applications, etc., has as standard a 18/8 stainless steel Barstock body rated at 6,000 p.s.i. with ¼ in. female connections which can be screwed BSP or API.

The body is available with alternative size trims down to the minimum, having a C_V or flow coefficient of 0.07. The trim which can be supplied in stainless steel or stellite has a needle-type plug giving linear flow characteristics and tight shut off. The valve can be used for pressure drops up to 5,000 p.s.i.



New Crosby control valve

The diaphragm superstructure which is designed for 3-15 p.s.i. air pressure is of aluminium alloy for lightness and can be supplied to give either reverse or direct action. The special diaphragm is of nylon-reinforced Neoprene. The overall height of this valve is less than 11 in. and it weighs 15 lb. With air fin bonnet the weight is 18 lb.

RESISTANCE THERMOMETER CONTROLLER

THE Foster resistance thermometer controller, model 3510, has been developed as a low cost, accurate and durable fully electronic temperature controller for use in association with special Foster fast response thermometer elements. Temperature ranges cover from —50°C. up to +350°C., and the 15-in. long scale is overprinted with the equivalent fahrenheit range.

All resistances comprising the Wheatstone bridge system are accurately calibrated and aged so that control point drift is eliminated. The control operates on a differential of 0.1°C. but can be detuned to operate on wider differentials (up to 5°C.) if required, by a simple adjustment of the sensitivity control. Variations in mains voltage within wide limits are said to make no difference to the accuracy of the instrument. Dimensions are 8-$\frac{1}{16}$ in. by 7½ in. by 5 in. Foster Instrument Co., Letchworth.

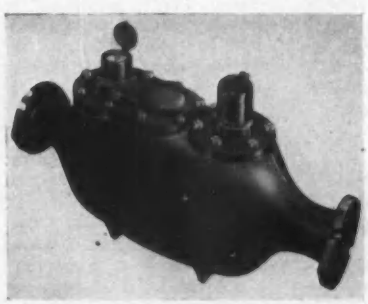
NEW KENT WATER METER

GEORGE KENT LTD., Luton, Beds, have introduced a new class of trade water meters, known as the Compound, for the measurement of widely varying cold-water flows. The Compound meter, which supersedes the Torrent combination meter, combines long life and reliability with a wide measuring range, which in the case of the 3-in. model is over 500:1, within accuracy limits of 2 per cent. To achieve this range, two separate measuring units are used, one for high and the other for low flows, both of which, with an automatic change-over valve to select the unit required, are contained in a single compact meter body. Only one measuring unit can register at a time.

There is no external piping, a fact which simplifies installation and maintenance.

Basically, the meter consists of a body casting containing four main components: a high- and a low-flow measuring unit, an automatic change-over or pilot valve, and a main valve.

The meter body and cover are of grey cast iron, treated with a bitumastic solution to give protection against corrosion. Removal of the elongated cover provides access to the Master meter, the pilot



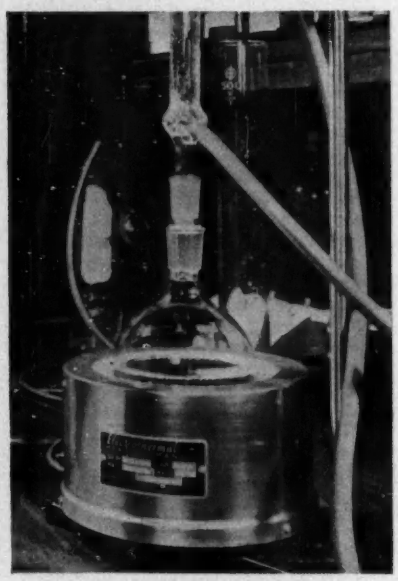
Kent compound water meter

valve and the main valve. The Master meter working chamber is located in the top of a cast-bronze housing, into the bottom of which the pilot-valve assembly is fitted. The Torrent meter, bolted to the circular cover, lifts out complete when this cover is removed.

Sealing holes and lugs are provided on both covers to prevent any unauthorised interference with the meter. To read the meter, all that is necessary is to add the quantities shown on the two straight-reading counter dials. Standard Compound meters are calibrated in Imperial gallons, cubic feet or metric units.

HEATING MANTLE RANGE

A RANGE of heating mantles with aluminium housing and flexible heating element is being marketed by Electrothermal Engineering Ltd., 270 Neville Road, London E7. The replaceable element is made up of an



Electrothermal heating mantle

insulated coil of nickel-chrome resistance wire attached to knitted glass fabric in coiled form, with increasing pitch from the bottom upwards, giving a larger concentration of heat on the bottom of the flask and decreasing towards the equator.

The larger mantles are provided with two circuits allowing the upper one to be disconnected when dealing with small volumes of liquid. The apparatus can be controlled by an energy regulator, switching the energy input and output on and off, or by an auto-transformer, which supplies variable output voltages with stepless control.

NEW BUNSEN BURNER

THE greatly increased use being made of propane/butane, methane/natural gas and sludge gas in laboratories where town gas supplies are not readily available, has prompted Amal Ltd., Witton, Birmingham 6, to market an addition to their

3-Jet Maximus bunsen burner

range of bunsen burners, the new 3-jet Maximus model.

The new model has been designed to permit the passage of the greater volume of primary air required with these high calorific value gases to give the same heat output as a smaller standard town gas burner; for example, the new burner liberates something over 3,000 kg. cal. per hour at normal gas pressures.

A finger-controlled needle valve in the gas supply line in combination with the grid burner head is said to allow great flexibility in pressure control with good turn down and the use of the three precision jets also contributes to the 'carpet' flame characteristic. Cooling fins are provided on the air tube stem which is mounted on a solid base fitted with a non-tip handle, for the purpose of dissipating the reflected heat.

The 3-jet Maximus is 7¼ in. high with a head diameter of 2¾ in.; it has been tested and approved at both the Shell and Calor Gas Laboratories and is available through recognised laboratory-ware wholesalers.

CONDUCTIVITY MEASURING BRIDGE

NEWLY added to the range of electrolytic conductivity bridges of Electronic Switchgear (London) Ltd., Works Road, Letchworth, is type MC-1. A portable instrument, it is designed for service in the laboratory or in the field. The use of low power consumption transistorised circuits has aided the production of a compact and light-weight instrument.

Self-contained in a hardwood carrying case, the instrument measures 11 in. by 7 in. by 6 in. overall and is supplied complete with a non-glass, non-metallic conductivity measuring cell, thermometer and cell-cleaning brush. The cell can be connected in a flow line or used free standing as a container on the bench.

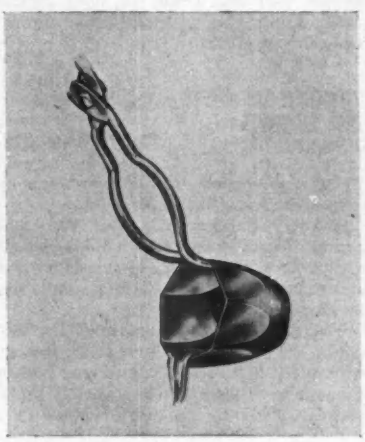
The normal measurement range, from 0.1 to 100,000 micro-ohms, is achieved in three stages, each selected by a range switch. The cell, claimed to be practically indestructible, is threaded at each end with ¾-in. BSP thread. For industrial use several cells may be permanently connected with the plant pipeline at strategic points where they are immediately available for check readings. This ensures no disturbance to plant, nor is there any risk of contamination by absorption of soluble gases. The cell is suitable for pressures up to 150 p.s.i.

The standard cell has a constant = 0.1. Cells having constants of K = 1.0, K = 1.5 and K = 2.0 are available. The only maintenance required is said to be of the battery, normal life of which is about two years.

POLYGON PLATINUM CRUCIBLE

A NEW polygon-shaped crucible, produced by Baker Platinum Division, 52 High Holborn, London WC1, and tested under laboratory conditions is said to show greater stability, versatility and ease of handling than the conventional, round-shaped type.

The crucible offers several advantages as a result of its flat sides and more stable flat bottom. Firstly, due to the crucible's flat sides, a better surface is provided for tongs, thus avoiding the tendency to crimp to which conventional crucibles are prone. Another advantage is that due to the shape of



New polygon-shaped crucible

the crucible, there is always a corner 'spout' opposite each flat side which facilitates easy pouring, and with these flat sides, two crucibles can be picked up and handled at one time.

Now available in the same capacities as their K series, the price of Baker polygon-shaped platinum crucibles is no more than for the round-shaped crucibles.

OCCA Dinner-dance to be held in February

THE Oil and Colour Chemists' Association will hold its biennial dinner-dance at the Savoy Hotel, London, on Friday, 28 February 1958.

Applications for tickets from non-members of the association should be addressed to the general secretary, R. H. Hamblin, Memorial Hall, Farringdon St., London EC4.

Nobel Prize Awarded to Sir Alexander Todd

SIR ALEXANDER TODD, Professor of Organic Chemistry at Cambridge, who has been awarded the Nobel prize for chemistry, began his contributions to the chemistry of natural products in 1931 when he joined Sir Robert Robinson in work on flower pigments.

His most recent work has been on the nucleic acids, which play an important part in the transmission of inherited properties. Sir Alexander has developed methods by which their synthesis can be approached. He devised methods for synthesising adenosine diphosphate and adenosine triphosphate. Previously he developed a number of ways of synthesising vitamin B_1 (aneurin). One of these methods has been employed in making it commercially.

Sir Alexander was educated at Allen Glen's School and at the University of Glasgow. He also studied at Oxford and Frankfurt. He has held posts at the

Sir Alexander Todd

Universities of Edinburgh, London and Manchester and was visiting lecturer at the California Institute of Technology in 1938.

He was appointed to the chair of organic chemistry at Cambridge in 1944 and has been chairman of the Advisory Council on Scientific Policy since 1952.

UK Display at Geneva Atomic Conference

CONCURRENTLY with the second conference on the peaceful uses of atomic energy, sponsored by UNO and to be held in Geneva from 1 to 14 September 1958, there will be a commercially-organised international exhibition in the Palais des Expositions, Geneva.

Nuclear Energy Trade Associations' Conference has undertaken the responsibility of co-ordinating the applications for space from UK participants. Experts and others with a special interest in nuclear energy will attend the conference on a world-wide basis so the UK section in the exhibition will afford an opportunity to demonstrate Britain's contribution to the development of the peaceful uses of atomic energy.

Closing date for booking exhibition space is 20 November 1957. Further information about the exhibition may be obtained from NETAC at 32 Victoria Street, London SW1.

George Kent Take Mobile Instrument Show to the Continent

George Kent's new mobile instrument exhibition van

BECAUSE they feel that specialist exhibitions are insufficiently widespread to enable the distant customer to keep abreast of rapid development of a wide range of new instruments, George Kent Ltd., Luton, Beds, on 25 October took their own large mobile exhibition to the Continent to visit customers at their works and to take part in technical conventions.

The panelled and carpeted interior, finished to represent a lounge, and with a small area set aside for discussion, is heated and will contain a comprehensive range of instruments to cover most industrial applications. Several of the Commander range, including the new electronic KE will be shown, together with Multelec instruments. A sectioned RS/C steamflow meter and M2 water meter will also be displayed, with a CM water meter, CM low-flow oil meter, unit-type draught gauges, Universal pH primary elements, and a display unit of small Dall and Venturi flow tubes and orifice fittings. A small electric furnace has been included for use with temperature-recording instruments.

Above the driving cab the Kent emblem will be illuminated, while the rear of the vehicle will carry the name and address of the local representative of the country through which it is passing. Most western and central European countries will be visited, beginning with the Interkama Exhibition at Düsseldorf.

Fielden Attack European Market

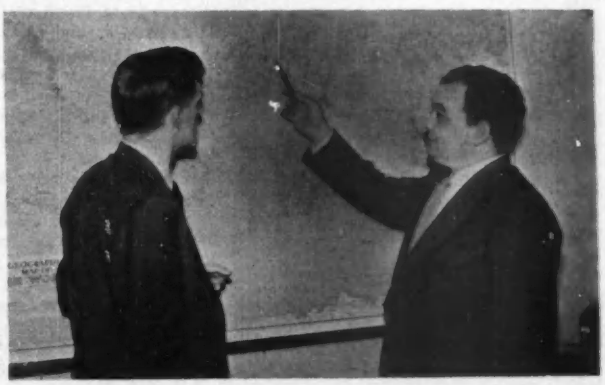
A TWO-PRONGED attack upon the European market is being made by Fielden Electronics Ltd., Wythenshawe, Manchester. Mr. Victor Thomas, general sales manager, flew to Germany on 5 November, and Mr. E. P. Beverley, export manager, left for Paris.

Mr. Thomas will set up a selling organisation and initiate a sales campaign for Fielden instruments in Germany. At the same time he will visit the Interkama Trade Fair at Dusseldorf and will then fly to Milan for talks with the newly established associate company, Fielden Electronics Italiana. Then he joins Mr. Beverley in Paris to wind up consultations with the company's French agents.

This tour is a part of the current Fielden campaign to claim a larger share of this important market at present dominated by foreign instrumentation.

ICI Avonmouth Project

Gloucestershire County Council have approved the £100 million 'outline' application by Imperial Chemical Industries Ltd. regarding the development of the 1,000-acre site adjoining the River Severn, near Avonmouth, about which details were released this summer (CHEMICAL AGE, 6 July, p. 17). This permission is subject to the approval of the Minister of Housing and Local Government and to a number of conditions.



V. Thomas, right, and E. P. Beverley discuss their tour

Chemist's Bookshelf

NUCLEAR ENGINEERING

NUCLEAR CHEMICAL ENGINEERING. By *M. Benedict* and *T. H. Pigford*. McGraw Hill, 1957. Pp. xiv + 594. 71s 6d.

The book describes some of the processes which have been developed as an integral part of the exploitation of nuclear energy. These processes fall into two main classes: purification by chemical or physico-chemical means and isotopic enrichment by principally physical operations; these are the separate provinces of the two authors.

In order that the reader may appreciate the exacting demands for purity and the limited choice of materials, certain aspects of nuclear physics are reviewed. There is also a useful review of radiochemistry which is necessary for the discussion of irradiated fuel decontamination.

Besides the purification of uranium from its ores, the available processes for the recovery of thorium, beryllium and zirconium are outlined. The preparation of graphite of high density and purity is not considered. The difficult separation of hafnium from zirconium is used as an example in an extended treatment of the principles of solvent extraction of metals. In the consideration of the processing of irradiated fuel elements and the recovery of plutonium and depleted uranium there is a discussion of the general properties of the rare earths and actinide elements. The mechanism of the formation of complex ions is described in sufficient detail to give an appreciation of the physical chemistry of the extraction operations.

The second section of the book describes the principles of isotopic separations. Such processes are so extended that they make economic demands not usually encountered in the application of such conventional processes as distillation. Here much capital may be saved by reducing the reflux ratio at intervals between the feed point and the product ends of the cascade giving rise to the design of the 'tapered' cascade. The optimisation of plant dimensions is reviewed in connection with the individual processes of distillation, electrolysis (with and without an associated catalytic exchange), separate exchange processes, thermal, 'mass' and 'gaseous' diffusion and the gas centrifuge. The chief interests are the enrichment of uranium in the $_{235}U$ isotope and the production of heavy water, but the separation of other isotopes is considered.

Emphasis throughout the book is on the principles of the individual processes rather than descriptions of items of equipment. The first section of the book, in particular, is a valuable textbook consolidation of much of the relevant information presented at the Geneva Conference. The second section presents the only concise review of the principles of isotopic separation known to the reviewer; an unusual but true process industry. It is a pity that the title 'Nuclear Chemical Engineering' was not allowed to cover a review of homogeneous reactors, a topic fraught with chemical engineering problems.

This review has mentioned the diversity of background material which the authors include. Such duplication with texts on related topics is well justified for the authors have achieved a text of use not only to chemical engineers (who, with Sherwood and Pigford on their shelf, may begrudge some of the space devoted to the principles of extraction) but also to chemists, physicists, metallurgists and any interested in nuclear engineering. There is sufficient information here for each to be able to use the volume without the need for constant reference to other texts. Where interest demands, fuller information may be found from the sources quoted in the comprehensive bibliography and list of references. J. S. M. BOTTERILL

Phosphorus & Fluorine

B. C. SAUNDERS

A study of some aspects of the chemistry and toxic action of organic compounds containing phosphorus and fluorine.

32s. 6d. net

The Terpenes IV & V

SIR J. SIMONSEN & W. C. J. ROSS

These two volumes, which complete the series on these important constituents of the essential oils of plants, deal with triterpenes.

Vol. IV, 70*s. net; Vol. V, Ready December*, 84*s. net*

CAMBRIDGE UNIVERSITY PRESS

ABCM Handbook on Toxic Gases

A SYSTEM OF LABELS FOR GASSING CASUALTIES SENT TO HOSPITAL. Association of British Chemical Manufacturers. 2nd Edition. 1957. Pp. v + 44. 3s to members; 5s to non-members. Labels 2s 6d a pad.

As a ready guide to the salient features of treatment demanded when industrial workers have suffered exposure to one of the numerous toxic gases and vapours used in chemical processes, this labelling system must already have smoothed the path of many a hospital casualty-officer and increased the chances of survival of his patient. In some minor respects, nevertheless, the new edition seems to lag behind current opinion and practice.

It is difficult to justify the mention of injection of nikethamide under the heading 'cardiac stimulants'. Nikethamide is now considered well-nigh useless as a cardiac or cardiovascular stimulant, though it may stimulate respiration. In doses large enough to be of any value it tends to be convulsant, and its use might often prove unwise. As a general-purpose cardiovascular stimulant, mephentermine sulphate or methoxamine hydrochloride would be more to the point, and neither of these drugs carries the risk of fibrillation inherent in adrenaline.

Then why advocate morphine (an analgesic) for convulsions due to methyl bromide? Surely a better choice would be sodium phenobarbitone or paraldehyde intramuscularly, with an inhalation anaesthetic as a standby. Although dimercaprol (BAL) is of doubtful efficacy in arsine poisoning, there seems little justification for withholding it, since it must be given early, and in any case within the first 12 hours, if it is to have any effect on the outcome of so dangerous an intoxication.

Labels to go with the booklet are supplied separately. They have been revised and brought up to date in the light of developments in manufacture and medical treatment since 1952.

PETER COOPER

GCE Organic Chemistry

INTRODUCTION TO ORGANIC CHEMISTRY. By *G. J. Brown*. Longmans, Green and Co. Ltd., London. 1957. Pp. 403. 16s.

This recent addition to an ever-lengthening list of introductory works has numerous interesting and unusual features which warrant its careful examination by all chemistry teachers taking GCE (advanced) and Intermediate classes.

Assuming that the student has independent access to works on practical organic chemistry, it gives outline preparations only of all those typical organic compounds usually included in a course of this kind. This policy has led to the complete omission of all densities and refractive indexes and to the relegation of all important melting points and boiling points to a table on the back end-paper.

There is commendable emphasis on structural formulae, though it is a pity that some of them are so untidily displayed.

Many important practical applications of organic chemistry are discussed in an interesting and informative manner, including fibres and detergents, drugs and dyes, plastics and petroleum products.

The last chapter—on 'Some theoretical

considerations'—deals in a clear, though necessarily condensed style, with some of the applications to organic chemistry of atomic and molecular orbitals and H-bonds. Students will probably require supplementary reading on these difficult points. Nevertheless, the author is to be commended for including them, since they have proved so helpful in the study of organic chemistry.

Tabular and diagrammatic summaries and a good selection of questions and problems taken from previous (unspecified) examination papers add further to the value of this useful work.

KENNETH STUART

Technology of Conductive Rubber

CONDUCTIVE RUBBER—ITS PRODUCTION, APPLICATION AND TEST METHODS. By *R. H. Norman*. J. Maclaren and Sons, London. Pp. 99. Price 16s.

This publication—the first of four technical manuals produced by staff members of the Research Association of British Rubber Manufacturers—fills an important place in literature on rubber technology and consists of a series of papers by the author which have appeared in the technical press during the past year on this highly specialised subject.

The author has studied this complex problem, its compounding and testing, most thoroughly and has reached a deeper understanding of this subject than has been known hitherto. His findings are presented in a logical and readable form.

While the major portion of the publication contains the author's original work, a liberal amount of information is included from a wide variety of sources which add value to the manual. The author draws attention to the difficulties encountered in obtaining accurate and reproducible results, emphasising how small differences in processing, of mastication, mixing and vulcanising can have a significant effect upon resistivity values.

The effect on resistivity by different compounding ingredients is illustrated, including the type of polymer used. Considerable space is devoted to carbon blacks, which are of high importance in compounds of this nature, and the profound effect which they can exert on resistivity values. The effects of stress, humidity, ageing and swelling on the resistivity are also studied.

A valuable chapter is included on test methods, giving in a convenient form the British and American standard test methods for measuring the resistivity of rubber compounds.

Variability of the resistivity of rubber compounds and the limitations of accuracy of test methods are discussed and a summary of possible sources of error are given.

The final chapter on the uses of conductive rubbers gives an excellent survey of the applications of these types of rubbers.

Although this book may not have a wide general appeal, it should prove invaluable to those engaged upon the problems of compounding, fabrication and testing of highly specialised products made from conductive rubber.

L. BOTTOMLEY

OXYGEN COMPOUNDS OF BORON

THE CHEMISTRY OF BORATES. Part I. By *P. H. Kemp*. Borax Consolidated Ltd., London. 1956. Pp. viii + 90. 12s 6d.

The chemistry of boron is a subject of interest to very many chemists. Apart from recent intensive academic work relating to the inorganic chemistry of boron, much interest is now being shown industrially in many aspects of the use of its compounds—not least being the use of this element in high energy fuels.

This review of the oxygen compounds of boron is very valuable in its up-to-date presentation. It summarises modern knowledge in a very succinct fashion indicating—as stated by Professor Emeléus in the foreword—not only the known chemistry, but also the gaps in our information.

The common alkali metal borates and their aqueous chemistry are well dealt with. Ammonium, calcium, magnesium, rubidium and caesium borates are reviewed in considerably less detail. Considerations of space did not permit the review of other metal salts, but nevertheless an interesting account of oxides, boric acid and perborates is given. Verdict: a valuable little book, and considering its specialist appeal, good value for the money.

T. S. WEST

Carbon-metal Bond Compounds

THE CHEMISTRY OF ORGANO-METALLIC COMPOUNDS. By *E. G. Rochow, D. T. Hurd* and *R. N. Lewis*. John Wiley and Sons, Inc., New York. Chapman and Hall Ltd., London. Pp. 344. 68s.

This book is modestly claimed by the authors as an attempt to present the chemistry of organo-metallic compounds in a form that will be useful to the student and to the more general reader. While this objective justifies to some extent the conversational and somewhat naïve style adopted and the absence of much formal theory, this is actually a comprehensive monograph which should appeal to the mature research worker.

It is concerned almost exclusively with the chemistry of compounds having carbon-metal bonds. Metal chelates, salts, and esters of the amphoteric elements are therefore omitted. The scope of the work is widened, however, by inclusion of the relevant chemistry of the metalloids in a broad sense of the definition. The wide field of chemistry thus covered is classified in a systematic way by reference to the periodic table.

Following an historical introduction, the first chapter is devoted to factors governing the physical and chemical properties of organo-metallic compounds as a group. The second chapter is concerned largely with the theory of the carbon-metal bond. The concept of the relative electro-negativity of elements, following Mulliken, Pauling, and Sanderson, is used to illustrate the dependence of ionic character on the nature of the metal atom.

After briefly indicating the relationship between bond polarity and chemical reactivity, the remainder of the chapter is taken up with the fundamental nature of the carbon-metal bond. Single and multiple covalent bonding between carbon and metals is considered, with particular reference to d-orbital resonance. The chapter concludes with a section on the distinctive bonding between carbon and the transition metals. In view of the critical significance of these valency principles a more detailed theoretical treatment might have been given here. The third chapter usefully describes general methods for the preparation of organo-metallic compounds.

The remaining chapters from IV to X

Chemical Engineering Practice

General Editor: HERBERT W. CREMER, C.B.E., M.Sc., F.R.I.C.
Past President of the Institution of Chemical Engineers and Past President of the Royal Institute of Chemistry
Managing Editor: TREFOR DAVIES, B.Sc., F.R.I.C., M.I.Chem.E.

A comprehensive work, in twelve volumes plus index, on Chemical Engineering as an integrated whole. Published to serve as a link between Physics, Chemistry and Engineering, to the better use of those sciences in process industries.

.....*an impressive achievement.*
Transactions of the INSTITUTION OF CHEMICAL ENGINEERS

price **95s.** *per volume*

Descriptive literature available post free—

BUTTERWORTHS SCIENTIFIC PUBLICATIONS
88 Kingsway, London, W.C.2. Tel. CHAncery 6681.

Chemist's Bookshelf

systematically survey the chemistry of organo-metallic derivatives by major groups. The treatment throughout does not claim to be exhaustive, although many references are quoted. A valuable feature of each chapter is the preliminary section on general group characteristics.

Chapter IV gives a particularly comprehensive account of the Group IV elements, in which some 500 references are listed for silicon alone. In Chapter X the difficult and diverse group of transition metals is presented remarkably well: the classification of different types of bonding in this series, and the correlation of atomic structure with physical phenomena is distinctly useful.

The concluding chapters of the book are somewhat brief. In Chapter XI, space has clearly precluded a fuller description of the use of organo-metallic compounds in synthesis. Chapter XII, which describes special types of organo-metallic compounds, contains interesting material, but the important group of metal carbonyls receives less than adequate treatment.

Reasonably priced, at 68s, the book can be confidently recommended to graduate students, as well as to the mature research worker. J. H. TURNBULL

Theilheimer on Preparative Procedures

SYNTHETIC METHODS OF ORGANIC CHEMISTRY, Vol. II. By *W. Theilheimer*. S. Karger, Basle. 1957. Pp. xvi + 494. 84 Swiss francs.

This new volume of a well-established annual series needs little introduction to most organic chemists. Since 1946 'Theilheimer' has been a useful tool of the worker who is burrowing in the literature in search of preparative procedures. Here he will find abstracts of relevant recent work classified with respect to the fundamental reactions involved. The reactions are arranged according to the bonds formed and broken, and they are designated by symbols, following a system devised by Weygand.

At first sight this cryptic notation may frighten the uninitiated, but those who persevere have found that it amply repays five minutes study by opening up a valuable storehouse of preparative information. In any case, the use of the classification system can be largely avoided by consulting the subject index, which lists starting materials and products, as well as reagents and the names of reactions. The abstracts given are generally sufficient for an appraisal of the methods; the original papers must be consulted for detailed preparative recipes.

Most of the entries in the present volume are abstracts from papers published between 1954 and 1956. In addition, the book includes a brief review, 'Trends in synthetic organic chemistry 1957', which highlights some procedures of special importance and mentions developments too recent for inclusion in the main body of the text. The volume is up to the standard of its predecessors and the series as a whole is an asset to any library of organic chemistry. PETER SCHWARZ

Qualitative Organic Analysis for Students

ELEMENTARY PRACTICAL ORGANIC CHEMISTRY: Part 2, Qualitative Organic Analysis. By *Arthur I. Vogel*. Longmans, Green and Co. Ltd., London. 1957. Pp. x + 644. 21s.

In Part 2 of this new three volume work, the first part of which has already been reviewed in these pages (CHEMICAL AGE, 11 May 1957, p. 806), Dr. Vogel reminds us forcefully of the great educational value of a proper course in qualitative organic analysis: by means of careful experiments, accurate observations and sound deductive reasoning the student is led to apply, to practical problems at the laboratory bench, some of the knowledge he has obtained from books and lectures.

The foundations of this present work are the chapters on the reactions and characteristics of a wide variety of organic compounds (wherein practical procedures are described in great detail), their solubilities in seven different solvents and methods of testing for functional groups.

Full practical instructions are also given for determining important physical constants such as melting point, boiling point, density and refractive index, for testing qualitatively for the elements, the preparation of derivatives and the treatment of mixtures.

Pagination is consecutive upon the previous volume and the same helpful system of cross-references is employed. The melting points and the boiling points of several thousand derivatives, arranged and classified into 47 tables will save the student a great deal of time, which would otherwise be spent in searching the literature; they will also be of use to the research man.

Part 2 of 'Little Vogel', as this new work will undoubtedly come to be called, will meet the requirements of all examining bodies who demand a knowledge of qualitative analysis. KENNETH STUART

Prices for Diacetone Alcohol

The prices quoted for diacetone alcohol in our issue of 26 October (p. 695) were lower than the current market values. The entry should have read:

Small lots: 5-gal. drums, £185; 10-gal. drums, £175. 40/45-gal. drums: under 1 ton, £148 to £150; 1-5 tons £147; 5-10 tons £146; 10 tons and over £145. Bulk deliveries; minimum 400 gal., £142; minimum 1,400 gal., £141; minimum 2,400 gal., £140.

SAC Meeting Discusses Flame Photometry

FLAME photometry was the subject of a meeting of the Society for Analytical Chemistry held at Newport, Monmouthshire, on 25 October. Chairman of the meeting was Dr. J. E. Page and the papers presented were 'Atomic Absorption Spectroscopy' by Dr. A. C. Menzies of Hilger and Watts and 'Recording flame photometry' by L. Brealey of Boots Pure Drug Co.

Dr. Menzies said that since Wollaston's discovery of the absorption lines in the spectrum of the sun which are known as Fraunhofer lines, little use has been made of the phenomenon for analytical purposes. A. Walsh in Australia drew attention to atomic absorption as a means of analysis, and made appropriate apparatus which he used more especially for the measurement of oscillator strengths.

At first it was hoped that the method would have very general application, but conditions had not yet been found which allowed this. Elements fell broadly into three classes: some, like magnesium, zinc, copper, were very sensitive, others like iron and chromium only moderately so, while some like aluminium were very insensitive indeed. The explanation of this was not straightforward, and there might be a number of causes operating.

A second point of interest was the curvature of the working curves got by plotting optical density of the flame against concentration of the metal being sprayed into the flame. Near the origin, i.e. for low concentrations, the curve was linear, but it turned over eventually, tending to become more parallel to the axis of concentration.

Flame photometry, said Mr. Brealey, was established as one of the most useful of analytical techniques, and as hotter flames were used the number of elements which could be estimated was increasing.

One of the most useful applications had been a study of the changes in flame background which occurred with variation in sample constitution. Many of the reported cationic interferences could be attributed to this change in background and by using recorded spectra it was a simple matter to eliminate this variable.

ABCM Committee Visits Sewage Works

ON their second visit to a local authority drainage works, the trade effluents committee of the Association of British Chemical Manufacturers recently visited the Birmingham Tame and Rea District Drainage Board. Dr. S. H. Jenkins, chemist to the board and president of the Institute of Sewage Purification, gave a talk on the board's experience in dealing with large volumes of trade effluent (up to 55 per cent of the total flow at the Saltley works) in admixture with domestic sewage.

The committee studied the effect of trade effluents on sewage purification processes at the Yardley works where the average daily flow is 9,190,000 gall. Analytical and research work on sewage and trade effluents was inspected at the board's laboratory at Rookery Park. The ABCM party was led by Dr. C. J. Jackson (Distillers Co. Ltd.)

PEOPLE in the news

● The appointment of MR. ERIK PAULSEN is announced by Styrene Copolymers Ltd. as the company's technical liason officer for Norway, Sweden, Denmark, Finland and Western Germany. He will be responsible for co-ordinating the activities of the company's selling agents in the above-mentioned countries with those of the company's sales department and laboratories in England. He will be located centrally at Copenhagen.

● MR. M. J. S. CLAPHAM, joint managing director of the metals division, Imperial Chemical Industries Ltd., has been elected to the council of the Birmingham Chamber of Commerce.

● MR. G. W. INNES, personnel director of the alkali division, ICI Ltd., succeeded MR. T. C. FAWCETT as the company's northern regional manager on 1 November. Mr. Fawcett, whose retirement was announced last week, joined ICI from Northern Sabulite Explosives Co. Ltd., on the acquisition of that company in 1930. In 1942 he was appointed joint managing director of the explosives group (later Nobel division) and, in 1945, became northern regional manager.

● DR. J. H. SCHULMAN, of Cambridge University, a Fellow of Trinity Hall and reader in surface chemistry, is to be the first incumbent of a new chair in chemical metallurgy at Columbia University established by the International Nickel Co. Inc. The new chair has been designated by the trustees as the Stanley-Thompson Chair of Chemical Metallurgy in honour of MR. R. C. STANLEY, chairman of International Nickel until his death in 1951, and DR. J. F. THOMPSON, his successor.

● DR. J. P. CHILTON, M.A., Ph.D., of Clare College, has taken up a three-year appointment as a demonstrator in the department of metallurgy, Cambridge University.

● DR. H. G. REID, general manager of the recently announced Imperial Chemical Industries £100 million Severnside project, is to become president and a director of Imperial Chemical Industries (New York) Ltd. with effect from 1 January 1958. Before his appointment as general manager of the Severnside site, he was personal assistant to Mr. W. D. Scott, an ICI director. Dr. Reid succeeds MR. K. W. PALMER, who is returning to the UK to become a joint managing director of the newly-formed heavy organic chemicals division of ICI. This division has been formed from a part of the company's Billingham division. Dr. Reid's successor at Severnside will be DR. H. S. HIRST, who is at present the technical department manager, Billingham division. All three appointments will take place with effect from 1 January.

Dr. H. G. Reid

● DR. R. T. COLGATE, chief chemist and chief technical works manager with Huntley and Palmers Ltd., is to retire at the end of the year. Dr. Colgate, who joined the company in 1913, is to be retained as scientific consultant. He will be succeeded by DR. R. FALCONER.

● MR. N. H. COLLINGS, publicity controller of Albright and Wilson Ltd., returned to this country on 6 November from a six-week tour of Canada and the US. He visited the company's subsidiary, the Electric Reduction Co. of Canada Ltd., which has plants at Buckingham, Varennes, Toronto and Vancouver. Mr. Collings has also visited Midland, Mich, for discussions at the headquarters of the Dow Corning Corporation, who are jointly associated with Albright and Wilson in the control of Midland Silicones Ltd.

● DR. E. SWINDLEHURST, who as announced briefly last week has been appointed technical director of T. Wall and Sons (Ice Cream) Ltd., became the company's technical officer in March 1957. He joined T. Wall and Sons Ltd. in 1952 after three years with Unilever. Dr. Swindlehurst graduated at Leeds University gaining both his B.Sc. and Ph.D. degrees in 1949.

● MR. THOMAS E. HOUGHTON, manager of the power department and director of general chemicals division of ICI, Ltd., retired on 31 October after 41 years' service with the company. After obtaining an engineering degree at Liverpool University, Mr. Houghton joined the staff of the chief engineer of the United Alkali Co. at Widnes in 1916, and for most of the time since then he has been at Widnes or Runcorn. He will be succeeded as division power manager by MR. J. H. HARRIS, joint deputy manager of the department.

● MR. J. E. HARVEY, M.P., a director of Manchester Oil Refinery (Sales) Ltd., has been appointed manager of the company. This is announced by Manchester Oil Refinery (Holdings) Ltd. Manchester Oil Refinery (Sales) who are responsible for sales in the home market, will shortly move from Manchester to London.

● MR. GEORGE C. WELLS has been appointed president of Union Carbide International Co. He succeeds MR. A. MACKENZIE who reaches retirement age this winter after more than 40 years with the corporation. Mr. Wells has been with Union Carbide since 1938 when he joined National Carbon Co. In 1949 he became responsible for the overseas manufacturing activities of that company and in 1951 he was appointed vice-president of the international company. He was made executive vice-president in 1955.

● MR. BRIAN N. REAVELL, deputy chairman of Kestner Evaporator and Engineering Co. Ltd., is to visit Brazil early this month for a general tour of business interests.

● MR. JAMES HUTCHISON, chairman of the British Oxygen group of companies, left London by air on 31 October on an extensive tour to visit the group's associated companies in Australia and Canada. He will also visit other interests of the group in the Far East. He is expected to return to England about 6 December.

Dr. S. W. Saunders, chairman of the new ICI heavy organic chemicals division, formation of which is announced on page 755

● MR. W. G. WOODS has been appointed technical representative of Siebe, Gorman and Co. Ltd. for the south-west of England and South Wales areas. His address is Shene House, Karen Drive, West Town, near Bristol.

● An English-born scientist, DR. HUGH STOTT TAYLOR, Dean of the Graduate School of Princeton University, US, has been awarded the Franklin Medal 'in recognition of his many notable contributions to the science of physical chemistry, particularly his development of the widely significant theory of heterogeneous catalysis, and his eminent achievements as author, editor and teacher'.

Working in conjunction with Sir Eric Rideal, Dr. Taylor's research efforts resulted in 1919 in the publication of 'Catalysis in Theory and Practice', the first significant book on catalysis. In 1922 he was made Professor of Chemistry at Princeton University and in 1945 was appointed Dean of the Graduate School.

● LORD ROCHDALE, new chairman of the Cotton Board, accompanied by MR. J. BROATCH, director general of the Cotton Board, paid an official visit and toured the laboratories and experimental workrooms of the British Cotton Industry Research Association last week. They were met by DR. D. W. HILL, director of research.

Commercial News

Gas Purification's New Product Costs Higher than Expected

THE cost of developing new products and bringing them into quantity production has been greater than anticipated, report the directors of Gas Purification and Chemical Co., in a preliminary survey of accounts for the 15-month period to 30 June 1957. However, it is pointed out that this feature is non-recurring and its benefits should soon begin to accrue to the company.

Immediate consequences, the directors state, must have an effect upon dividend policy which was not apparent when the interim declaration was made in March last.

It is hoped, the survey says, that preliminary figures will be announced during or before the first fortnight in December and to publish the accounts in full later in that month, convening the annual general meeting in January next, when it may also be possible to make a preliminary report on the results of the first six months' trading in the current financial year 'which are so far encouraging'.

The interim for the 15 months ended 31 March last was 20 per cent.

Erinoid Ltd.

Trading profit, subject to audit, of Erinoid Ltd., manufacturers of plastics materials, for the year ended 31 July was £160,006 (£174,337). Net balance amounted to £55,685 (£52,994). A dividend of 7½ per cent (same) is declared on ordinary and £75,229 (£45,656) is carried forward.

German Shell Co.

To finance part of its £60 million expansion programme, German Shell Co. Hamburg, is to raise its capital by DM50 million to DM350 million (£30 million approximately). This programme includes the construction, near Cologne, of a refinery having a 4 million ton annual throughput, expansion of a petrochemical plant near Bonn trebling the capacity of the company's Hamburg refinery to 2.6 million tons throughput a year and participation in the Rotterdam-Ruhr pipeline scheme.

Greef-Chemicals

Greeff-Chemicals Holdings have announced an offer of 200,000 ordinary 5s shares at 10s each to ordinary stockholders registered on 4 November, in the proportion of one share for every 10 ordinary 5s units held on that date. Ordinary shareholders will also be given the opportunity to apply for any excess shares. Any further dividend for 1957 will be paid on the new shares. Share price quoted on Tuesday was 13s 10½d.

CIC consent has been obtained for the issue. The proceeds are to be used by the subsidiary, R. W. Greeff and Co., to increase its investments in British Titan Products.

Satisfactory trading results are reported by the company for the first 10 months of the current year. Providing this trend continues, the directors hope to be able to recommend a final dividend of not less than 11 per cent for 1957 on the capital as increased by the proposed issue.

McKechnie Brothers

Group profits of McKechnie Brothers Ltd., manufacturers of non-ferrous metals and chemicals, were £393,823 (£1,052,162) for the year ended 31 July. After tax, the net profit was £133,843 (£525,132). Final dividend of 10 per cent, making 15 per cent (same), is declared. Annual meeting will be held on 19 December.

Charles Winn and Co.

Consolidated profit of Charles Winn and Co., valve makers, for the year ended 31 July, was £83,547 (£73,748). After tax, profit was £38,443 (£30,646). Final dividend of 5 per cent, making 10 per cent on increased capital (same on old capital), is proposed.

INCREASES OF CAPITAL

W. J. BUSH AND CO. LTD., chemical and dyestuffs intermediates manufacturers, etc., 28 Ash Grove, London E8. Increased by £900,000 beyond the registered capital of £1,100,000.

CHEMICAL AND PETROLEUM INVESTMENTS LTD. 14 Waterloo Place, London SW1. Increased by £700,000 beyond the registered capital of £300,000.

GLOVERS (CHEMICALS) LTD. Wortley Low Mills, Wortley, Leeds 12. Increased by £20,000 beyond the registered capital of £30,000.

FOR YOUR DIARY

MONDAY, 11 NOVEMBER

Royal Institute of Chemistry—London; Woolwich Polytechnic. 6.45 p.m. 'Silicones' by Dr. G. G. Freeman.

Society of Chemical Industry—Liverpool; Nicholson Theatre, Liverpool University. 7 p.m. 'Modern crystalline high polymers' by Prof. C. E. H. Bawn.

TUESDAY, 12 NOVEMBER

Plastics Institute—Edinburgh; North British Hotel. 7.30 p.m. Meeting on 'Recent developments in polyurethane foams and polyurethane rubbers'.

SCI Chemical Engineering Group—London; 14 Belgrave Square, W1. 5.30 p.m. 'Washing of solids' by J. E. Grew and P. K. Williamson.

WEDNESDAY, 13 NOVEMBER

Institution of Chemical Engineers—Birmingham; The Midland Institute, Paradise Street. 6.30 p.m. 'Fibre reinforced plastics in the chemical industry' by F. F. Jaray.

Society for Analytical Chemistry—Birmingham; University, Edgbaston. 7 p.m. 'A new line in the development of metal indicators' by Dr. Rudolf Pribil.

SAC—Widnes; College of Further Education, Victoria Square. 7 p.m. 'Ion exchange chromatography applied to closely related organic compounds' and 'Trace element determination with the aid of ion exchange membranes' by D. Logie.

THURSDAY, 14 NOVEMBER

Institute of Metals—London; 17 Belgrave Square, W1. 6.30 p.m. 'Low-temperature deformation of metals' by Dr. T. H. Blewitt.

Royal Society—London; Burlington House, W1. Discussion 'The physics and chemistry of water' opened by Prof. J. D. Bernal.

SCI Food Group—London; Imperial Chemical House, Millbank, SW1. 8 p.m. Conversazione.

SCI Oils and Fats Group—Manchester; Textile Institute, 10 Blackfriars Street 3. 7 p.m. 'Economics of surface activity' by K. Tomlinson.

SCI Microbiology Group—London; 14 Belgrave Square. 6.30 p.m. Meeting on 'Production of Riboflavin'.

Market Reports

STEADY FLOW OF NEW BUSINESS

LONDON Deliveries to the main consuming industries against contracts have continued to cover good quantities and there has been a steady flow of new home business to meet current requirements, whilst export call is well maintained. Fertiliser demand is reported to be satisfactory for the period.

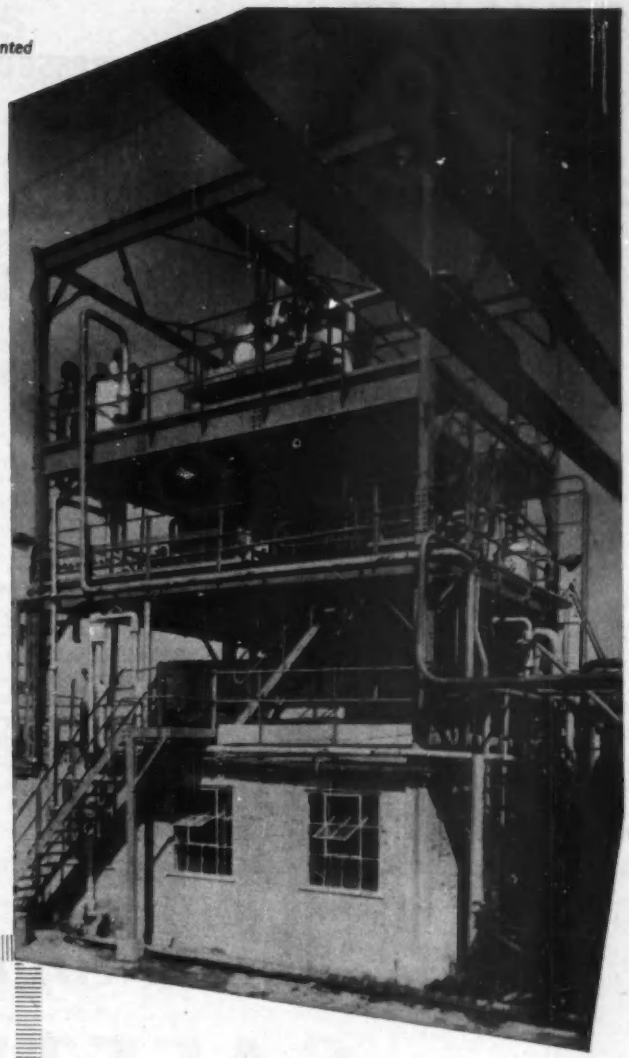
With few exceptions, prices are unchanged at recent levels and the undertone of the market is firm.

Most of the tar products are in good request with pitch being taken up in good quantities by home users and an expanding export demand for the material. Creosote oil is also an active item whilst naphthalene is firmer against a good home demand.

MANCHESTER Trading conditions on the Manchester chemical market during the past week are somewhat quieter than they have been and this applies to actual new business on home-trade account and to the flow of enquiries. Contract deliveries have also been affected to some extent, though these are fairly steady on the whole. The shipping movement, however, seems to be well maintained. Actual price changes have been of little consequence, but the general undertone is firm. Fair activity is reported in some sections of the fertiliser trade and there is a continued steady demand for most of the tar products.

GLASGOW A much more active week is reported from the Scottish market with demands from both textile and heavy industries well maintained, and a high volume of varied enquiries. Fertilisers showed some little activity, mostly in regard to forward bookings. Prices remained fairly firm with little or no change and the overseas market remains at a good level.

The Continuous Nitrile Plant—The heart of the patented Armour process for producing cationic chemicals.



are you an up-to-date executive?

You will want to keep abreast of industrial progress to improve your present process, or add new lines. In either case, contact us *now*!

Armour Chemical Division are the world's biggest producers of cationic chemicals, offering a comprehensive technical service for the use of their

ARMEENS (*Aliphatic amines*)

DUOMEENS (*Diamines*)

ARQUADS (*Water and oil soluble quaternaries*)

ETHOMEENS (*Ethylene oxide compounds of amines*)

ARMACS (*Amine acetates*)

and other chemicals

There is an Armour Product for nearly every industry, including:

AGRICULTURE, FERTILIZERS,
ANTI-BIOTICS, PAINT AND PIGMENTS,
ROAD CONSTRUCTION, SYNTHETIC RESINS,
NATURAL AND MAN-MADE FIBRES,
LAUNDRY, MINERAL FLOTATION,
RUBBER, CRUDE OIL PRODUCTION,
PETROLEUM PRODUCTS, DETERGENTS,
METAL WORKING, WATER TREATMENT—

to mention only a few

ARMOUR & COMPANY LTD. CHEMICAL DIVISION

LINDSEY STREET, LONDON, E.C.1. CLERKENWELL 9011. INTERNATIONAL TELEX 23567

Branches or Agents throughout the world

Chemical Stocks & Shares

MARKETS REMAIN DEPRESSED

MARKETS have remained weak and there have been generally dull conditions in every section. Influences tending to restrict business were the uncertain behaviour of the US market, and the prospect of industrial disputes at home.

Industrial shares have had much to contend with over the last two weeks. Various leading companies, namely, Courtaulds, A. E. Reed, Birmid and United Glass Bottle presented very dull interim trading reports and announced cuts in their interim dividends; many other shares are reaching fresh 'lows'.

For the next few weeks, markets will undoubtedly be hesitant and adjustment will take some time. In all probability, however, the Government's latest determination on the wages front should go a long way to help a general turn round of markets.

ICI were barely steady at 37s, Borax 5s Dfd. at 20s 9d closed a little firmer, Hickson and Welch 28s 6d and Lawes Chemicals 16s 3d were dull spots.

Dealings started in Monsanto Chemicals 6 per cent debenture 77/82 (£25 paid) which opened at 26¼, and have remained at around 26⅞. Brothertons 18s 6d and British Chrome 9s were unaffected by news of the discussion between them with a view to a merger. Bakelite at 21s 3d shed 6d overall.

1957 High	1957 Low		5 Nov.	Change on last two weeks
23/7½	16/4½	Albright & W. 5/-	16/9	—3d
11/9	10/6	Anchor 5/-	11/9	+3d
1/3	1/-	Ashe 1/-	1/-	—1½d
24/6	20/-	Bakelite 10/-	21/3	—6d
7/10½	4/10½	Berk 5/-	5/-	—
36/-	19/6	Borax 5/-	20/9	+1½d
10/9	8/10½	Bt. Chrome 5/-*	9/-	—
13/10½	10/3	Bt. Glues 4/-	10/6	—1½d
6/4½	4/9	BIP 2/-	5/1½	—
8/6	5/6	Bt. Tar 2/6	6/7½	—2½d
22/3	17/6	Brothertons 10/-	18/6	+6d
35/-	27/3	Bt. Xylonite	30/-	+6d
4/4½	3/6	Coalite 2/-	3/7½	+1½d
60/3	46/6	Fisons	47/-	—
		Glaxo	30/6	—4½d
9/6	7/9	Hardman & H. 5/-	7/6	—6d
34/6	24/1½	Hickson & W. 10/-	28/6	—1/-
46/6	36/3	ICI	37/-	—6d
4/9	2/7½	Kleeman 1/-	3/-	+3d
22/1½	14/6	Laporte 5/-	14/6	—9d
22/-	15/-	Lawes 10/-	16/3	—
19/3	12/4½	Monsanto 5/-	13/1½	—4½d
15/6	11/-	Reichhold 5/-	11/3	—3d
11/9	9/-	Yorkshire Dye 5/-	10/-	—

* The 22 October price noted on 26 October (P.695) should have read 9s. 6d, not 5s.

Oxygen Compressing Station

A new oxygen compressing station is being built by British Oxygen Gases Ltd. at Durranhill Industrial Estate, Carlisle. The building is on a 1.8 acre site leased from Carlisle Corporation, and in addition to compressing oxygen into cylinders, it will serve as a distribution centre for the company's range of industrial gases.

Site work has just commenced, and the station is expected to be completed in the spring of next year.

TRADE NOTES

Sole selling agents appointed for Aflamman flame-proofing textile products of Dr. Quehl and Co., GmbH, of Speyer, Germany, is the Tennant Group of Companies. Tennants (Lancashire) will be handling all inquiries for Aflamman.

New Scottish Office

J. M. Steel and Co. Ltd., chemical merchants and distributors, of Kern House, 36–38 Kingsway, London WC2, Manchester and Birmingham, have opened new offices in Glasgow at 144 St. Vincent Street, C2.

Change of Name

STEMCO Ltd., manufacturing chemists, etc., 66/70 Parkway, London NW1, have changed their name to Gilbarco Ltd.

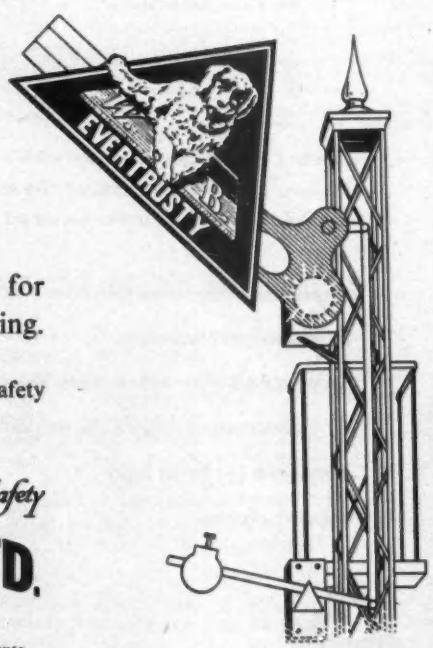
New Bradford Factory

Shaw Moisture Meters have now moved into their new factory and laboratories at Rawson Road, Bradford. The head office address at 31 Market Street, Bradford, is unchanged. The move has been made to keep pace with increasing demand, following the introduction of the new Shaw moisture meter early this year.

HD Polythene Sheeting

Sheeting material made from high density polythene is being produced by Iridon Ltd., 1 Avery Row, Grosvenor Street, LondonW1. Known as LP1300, this material has a melting range of 125° to 135°C. and can be sterilised with boiling water.

The Go-ahead Signal for SAFETY



Be on the right lines. Train your men to ask for "Evertrusty" first class Gloves and Protective Clothing.

The complete "EVERTRUSTY" range includes gloves and safety equipment to suit every industrial requirement.

Specialists in Industrial Safety

WALLACH BROS. LTD.

For over 70 Years

EVERTRUSTY

Members of the Royal Society for the Prevention of Accidents

49 TABERNACLE STREET, LONDON, E.C.2. Telephone: CLErkenwell 1448/9 Telegrams: Hammerman, Ave, London

NEW PATENTS

By permission of the Controller, HM Stationery Office, the following extracts are reproduced from the 'Official Journal (Patents),' which is available from the Patent Office (Sale Branch), 25 Southampton Buildings, Chancery Lane, London, WC2, price 3s. 3d. including postage; annual subscription £8.

Specifications filed in connection with the acceptances in the following list will be open to public inspection on the dates shown. Opposition to the grant of a patent on any of the applications listed may be lodged by filing patents form 12 at any time within the prescribed period.

AMENDED SPECIFICATIONS

On sale 11 December or as soon as possible thereafter

Platinum alumina catalyst containing added aluminium chloride. Esso Research & Engineering Co. **762 728**

ACCEPTANCES

Open to public inspection on 11 December

Derivatives of naphthalene and the manufacture thereof. Wellcome Foundation Ltd. **787 690**

Polymerisation of esters of acrylic and methacrylic acid. Rohm & Haas Co. **787 693**

Preparation of organic acid esters of cellulose. Celanese Corp. of America. **787 487**

Copper containing trisazo dyestuffs. Farbenfabriken Bayer AG. **787 416**

Hydrocarbon-carbohydrate derivatives. Universal Oil Products Co. **787 531**

Refining of iron. Brassert Oxygen Technik AG. **787 441**

Interpolymer latices and process for the production thereof. Monsanto Chemical Co. **787 703**

Test tablet. Miles Laboratories, Inc. **787 533**

Toxin-inactivating substance and preparation. Canadian Patents & Development Ltd. **787 607**

High vacuum distillation apparatus. Sulzer Freres Soc. Anon. **787 706 787 707**

Methods of producing a conductive layer of graphite on an insulating surface. Philips Electrical Industries Ltd. **787 708**

Apparatus for the determination of melting points. Soc. des Usines Chimiques Rhone-Poulenc. **787 709**

Secondary amines. Ethicon, Inc. **787 419**

Isomerising dialkyl benzenes in the liquid phase. Naamlooze Vennootschap De Bataafsche Petroleum Maatschappij. [Addition to 786 305.] **787 490**

Crystallisation procedure and apparatus. Phillips Petroleum Co. **787 608**

Manufacture of gasoline. Universal Oil Products Co. **787 538**

Catalytic conversion of hydrocarbons. Universal Oil Products Co. **787 539**

Substituted tetrahydronaphthalenes. Givaudan & Cie. Soc. Anon., L. **787 541**

Recovery of free fatty and/or resinous Aktiebolaget Separator. **787 715**

Production of copolymers and compositions containing same. Monsanto Chemical Co. **787 420**

Anthraquinone dyestuffs. Badische Anilin- & Soda-Fabrik AG. **787 716**

Process for the allylation of benzene and homologous hydrocarbons. Soc. des Usines Chimiques Rhone-Poulenc. **787 615**

Preparation of biguanide derivatives containing active chlorine. Henkel & Cie. Ges. **787 620**

Vulcanisation accelerators. United States Rubber Co. **787 452**

Method in or relating to stabilisation of halogenated hydrocarbons. Columbia-Southern Chemical Corp. **787 726**

Manufacture of beta-carotene. Hoffmann-La Roche & Co. AG, F. **787 497**

Conversion of polyethylene terephthalate into dimethyl terephthalate. Vereinigte Glanzstoff Fabriken AG. [Addition to 755 071.] **787 554**

Open to public inspection on 18 December

Processes of producing uranium trioxide. Larson, C. E. **787 742**

Manufacture and use of condensation products containing nitrogen. Ciba Ltd. **787 733**

Treatment of ferrous metal surfaces and composition therefor. Freud, H. M. **787 841**

Manufacture of monoazo-dyestuffs containing chromium. Farbwerke Hoechst AG. **787 986**

Method of and apparatus for packing liquid or paste-like substances in containers of synthetic thermoplastic material. Farbwerke Hoechst AG. Vorm. Meister, Lucius, & Brüning. **787 802**

Removing weakly acidic substances, especially mercaptans, from hydrocarbon fluids. Socony Mobil Oil Co., Inc. **787 745**

Process for maintaining the activity of catalysts in the catalytic oxidation of organic compounds. Ciba Ltd. **787 734**

Oxygenated organic compounds. General Electric Co. **787 748**

Manufacture of cellulose ester filamentary materials. British Celanese Ltd. [Cognate application 35660, Dec. 9, 1954.] **787 899**

Monoazo dyestuffs and metallised derivatives thereof. Sandoz Ltd. **787 843**

Production of silicofluorides. Fisons Ltd. **787 749**

Conversion of powdered materials into pellets. Fawkham Developments Ltd. **787 993**

Preparing halogen di-substituted ethylenes. Knapsack-Griesheim AG. [Additional to 736 375.] **787 904**

Tetracycline by fermentation. Pfizer Corporation. **787 895**

Extraction of soluble material from artificial, particularly synthetic filaments, films and the like. American Cyanamid Co. **787 999**

Manufacture of indanthrone. Ciba Ltd. **787 908**

Method and apparatus for reacting carbon containing gaseous compounds in the presence of a catalyst. Kellogg Co., M. W. **788 000**

Preparation of acid halides of carbon-to-phosphorus bonded acids of phosphorus. Lubrizol Corp. **787 850**

Recovery of chlortetracycline from solutions thereof. Pfizer & Co., Inc., C. [Addition to 718 020.] **787 896**

Processes for washing composite materials such as coal, ore or other granular material. Preparation Industrielle des Combustibles. **788 006**

Catalytic desulphurisation of petroleum hydrocarbons. British Petroleum Co. Ltd., Moy, J. A. E., and Rowland, J. **787 911**

Aqueous reserpine solutions. Ciba Ltd. [Addition to 734 108.] **787 856**

Treatment of light metal. Magnesium Elektron Ltd. **787 960**

Stable steroid compositions. Upjohn Co. **787 912**

Oxidation of mercaptans. Standard Oil Co. **787 914**

Preparation of aromatic nitriles. Wellcome Foundation Ltd. **787 858**

Adhesive compositions. Minnesota Mining & Manufacturing Co. **788 009**

Working up of mixtures containing vinyl ethers of aliphatic or cyclo-aliphatic alcohols containing four or more carbon atoms and these alcohols themselves. Deutsche Solvay-Werke Ges. **787 915**

Inhibitors of oxidation. Imperial Chemical Industries Ltd. **787 859**

Platinum-alumina catalyst. Standard Oil Co. **787 755**

Wax processing. South African Coal & Gas Corp. **787 921**

Manufacture of epoxy compounds containing hydroxyl groups. Farbenfabriken Bayer AG. **787 922**

Manufacture of polyester resins. Hudson Foam Plastics Corp. **787 760**

Separating a fluid mixture into at least two products streams. Phillips Petroleum Co. **787 763**

Mixing apparatus. Imperial Chemical Industries Ltd. **787 764**

Separation of acetylene. British Oxygen Co. Ltd. **787 865**

Recovery of cycloserine. Commercial Solvents Corp. **787 740**

Heterocyclic compounds. Allen & Hanburys Ltd. **787 923**

Production of flexible cellular materials from polyisocyanate reaction products. Goodyear Tire & Rubber Co. **787 867**

Production of phthalic anhydride. Badische Anilin- & Soda-Fabrik AG. **787 924**

Alkaline earth metal salts of cycloserine and process of producing same. Commercial Solvents Corp. **787 741**

Filters. Birmingham Small Arms Co. Ltd. **787 870**

Recovery of gamma-butyrolactone. Celanese Corp. of America. **787 927**

"VULCAN" BRAND IRON AND STEEL CARBOY HAMPERS SAFETY CRATES, PACKED CARBOYS

HARRIS (LOSTOCK GRALAM) LTD.

LOSTOCK GRALAM, NORTHWICH, CHESHIRE.

Classified Advertisements

CLASSIFIED RATES: All sections 5d. per word. Minimum 8/-. Three or more insertions 4d. per word. Box Number 2/- extra. Up to 10 a.m. Tuesday for insertion same week.
SEMI-DISPLAY: 30/- per inch. Three or more insertions 25/- per inch.
SUBSCRIPTION: Annual Subscription of 52/6 brings 52 weekly copies of CHEMICAL AGE direct to your address from the printer (postage paid by the publishers), and a copy of CHEMICAL AGE YEAR BOOK.
COMPANY MEETINGS AND REPORTS: £12.12.0 per column. Three column measure (approximately 360 words).

EDUCATIONAL

A.M.I.CHEM.E.—More than one-third of the successful candidates since 1944 have been trained by T.I.G.B. All seeking quick promotion in the Chemical and Allied Industries should send for the T.I.G.B. Prospectus. 100 pages of expert advice, details of Guaranteed Home Study Courses for A.M.I.Chem.E., B.Sc.Eng., A.M.I.Mech.E., A.M.I.Prod.E., C. & G., etc., and a wide range of Diploma Courses in most branches of Engineering. Send for your copy today—**FREE.** T.I.G.B. (Dept. 84), 29 Wright's Lane, London, W.8.

SITUATIONS VACANT

CHEMICAL ENGINEER. With several years industrial experience, preferably in the Heavy Chemical or Allied Industries, required for a Chemical Factory situated 30 miles North of London. Minimum qualifications—B.Sc.Hons. and/or A.M.I.Chem.E. The post offers scope for a man with initiative and drive and will cover practically all aspects of Chemical Engineering design in addition to Plant investigations. An attractive salary is offered. Write Box CA.597 c/o 191 Gresham House, E.C.2.

CHIEF CHEMIST required for Industrial Laboratory. Analytical work on raw materials. Knowledge of glues, binding materials and varnishes an advantage. Superannuation and other welfare schemes. Write stating age, full particulars of qualifications and salary required to Box 3575.

FOR SALE

★★★ **WHEAT STARCH** ★★★
at competitive prices.
Specially refined quality for the food trades, and other grades suitable for many industrial purposes.
Starch Division
Procea Products, Ltd. (Dept. 1.)
47 Dean Street,
London, W.1.

FOR SALE. 100 tons Wool Wax Residue. Regular buyers wanted. SAMPLE FREE. **H. M. KERSHAW, OXENHOPE, KEIGHLEY.**

DEGREASING AND CLEANING DOWN—One man can do the work of five with B. & A. steam-cleaning-with-detergent equipment; ready for use from your own steam supply. "Speedy-lectric" high-efficiency steam lance; 30 ft. steam hose; 15 ft. detergent hose; £44 complete. Ideal for the Chemical industry. Leaflet L.126 **HYZONE LTD.**, 2 Rosslyn Crescent, Harrow, Middlesex.

FOR SALE: continued

ONE—Water Treatment Plant by United Filter & Engineering Co. Ltd., capacity approx. 7,000 gallons per hour, complete with Pumps. Chemical Injection Gear, Brine Tank, and all fittings. Reply—Box No. 3576.

MORTON, SON AND WARD LIMITED
offer
NEW UNITS in stainless or mild steel made to requirements:
CONDENSERS,
MIXING VESSELS,
JACKETED PANS with or without Mixing gear.
'MORWARD' 'U' shaped trough **MIXERS** with or without jackets,
TANKS: CYLINDERS: RECEIVERS: PRESSURE VESSELS and **AUTOCLAVES.**
NEW (ex stock):
JACKETED PANS:
100g, 150g and 200g in mild steel, suitable for 100 lb in jacket. With or without mixing gear.
SECOND HAND (ex stock):
600g totally enclosed **JACKETED VESSEL**, 80 lb p.s.i. in jacket, 50 lb internal.
600g open top **JACKETED VESSEL**, 80 lb in jacket.
350g (2 available) totally enclosed **JACKETED PANS** 80 lb in jacket, 50 lb internal.
400g open top **JACKETED PAN**, open top, 80 lb in jacket.
300/400g **PRESSURE VESSELS** with detachable tops, standing on 4 feet, 80 lb p.s.i. internal pressure.
STIRRING GEAR can be fitted to any of the above vessels.
Enquiries invited:
MORTON, SON AND WARD LIMITED,
WALK MILL,
DOBCROSS, NEAR OLDHAM,
Lancs.
'Phone Saddleworth 437

NEW CONDITION Horizontal 'U' Trough **TILTING MIXER**, 4 ft. x 1 ft. 6 in. x 2 ft. deep. 12 Paddle Blades. Glanded. Lying our No. 2 Depot. Swallowfield, Berks. Apply **WINKWORTH MACHINERY LTD., 65 High Street, Staines, Middx.** Telephone 1010.

PHONE 98 STAINES
(Four) 2,500 gall. **RUBBER-LINED** Rectangular Tanks. (Three) 1,800 gall **GLASS-LINED** Cyl. Enc. Tanks. Welded Steel Cyl. Enc. Tanks, 500, 1,000, 2,000, 2,500, 3,000 and 5,000 galls. "Z", Fin and Cyl. Mixers, Pumps, Hydros, Condensers, Ovens, Refiners, Disintegrators, Crushers, Grinders, Conveyors, etc.
HARRY H. GARDAM & CO. LTD.

***BOX NUMBERS:** Reply c/o "Chemical Age" · Bouverie House · Fleet Street EC4.*

FOR SALE: continued

TWO "ALBRO" FILLING MACHINES No. 3. GRAVITY WEIGHT OPERATED for liquids and semi-liquids, range 6 ounces to 28 lbs. Purely mechanical. Both very excellent condition. **YOUNG'S SIFTER AND MIXER,** capacity 300 lbs, also **GARDNER** 200 lbs. and **GARDNER** 30 lbs. **VERTICAL WELDED STEEL OPEN TOP MIXER,** pan revolves around central shaft—pan 35" by 17½"—**A SELF CONTAINED PORTABLE UNIT,** with Direct drive Higgs 3 HP. Electric AC. Motor. Reply Box 3577.

HP RIVETTED GAS RECEIVER, 24 ft. 8in. long, 7ft. diam. WP 60 lb./sq. inch. Excellent condition, promptly available. **MAYER, NEWMAN & CO. LTD.,** 15 Arundel Street, W.C.2. Temple Bar 9711.

TENDERS

TENDERS ARE INVITED FROM MANUFACTURERS who can deliver the produce from their own manufacture for supply of 50,000 tons **AMMONIUM SULPHATE,** 25,000 tons **CALCIUM AMMONIUM NITRATE** and 40,000 tons **UREA.**

Supply is required in long tons, for delivery in instalments from December, 1957, to April, 1958, C. and F. Indian Port of discharge/F.O.B. stowed port of exit.

For specifications and further details, apply immediately to:

The Director General,
India Store Department,
Government Building,
Bromyard Avenue,
Acton,
London, W.3,

quoting reference S.2700/57.CS/MIS.

AUCTIONEERS, VALUERS, Etc.

EDWARD RUSHTON, SON AND KENYON
(Established 1855)
Auctioneers, Valuers and Fire Loss Assessors of
CHEMICAL WORKS PLANT AND MACHINERY
Telephone 1937 (2 lines) Central Manchester

WORK WANTED & OFFERED

PULVERISING of every description of chemical and other materials. Collections, storage, deliveries. **THOMAS HILL-JONES, LIMITED, INVICTA WORKS, BOW COMMON LANE, LONDON, E.3. (TELEPHONE: EAST 3285.)**

CRUSHING, GRINDING, MIXING and DRYING for the trade
THE CRACK PULVERISING MILLS LTD.
Plantation House,
Mincing Lane,
London, E.C.2

BOTTLING, BAGGING, PACKAGING,
Liquids, Powders, etc.
FORMULATING
under analytical control.
Box No. 3574

GRINDING, CRUSHING AND GRADING
FINE GRINDING LTD.,
BLACKHOLE MINE, EYAM
TELEPHONE: EYAM 227

WANTED

REQUIRED. Chemical by-products, waste materials and residues. Please send particulars to: **BIOSUN LIMITED, WINDMILL ROAD, SUNBURY-ON-THAMES.**

WANTED: continued

INDUSTRIAL BY-PRODUCTS LTD., 16 Philpot Lane, London, E.C.3, will be pleased to receive particulars of any by-products, waste materials and residues for disposal.

THE INDENT GAZETTE

An average of 220 enquiries for goods from export merchant buyers, including Chemicals of all descriptions, appear weekly in The Indent Gazette. Specimen copy sent on application to **154 Fleet Street, London, E.C.4.**

"Fullersite"
SLATE FILLER
WHEREVER AN INERT FILLER
IS REQUIRED FULLERSITE
IS THE IDEAL MATERIAL
PENRHYN QUARRIES LTD.
PORT PENRHYN, BANGOR, NORTH WALES

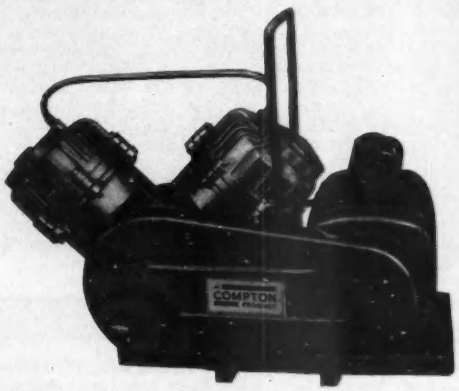
now *in a handy pack*

this is the **easy-to-use** *optical whitening agent for Papers and Textiles*

CASTLEFORD 2607
YORKSHIRE

Hickson & Welch Ltd.

COMPTON



Type 2D and 2D-625 Series 2

OIL-FREE AIR COMPRESSORS

These machines give an absolutely oil-free output and are therefore suitable for many industrial purposes where contamination by lubricating oil cannot be tolerated.

DAWSON McDONALD & DAWSON LTD.
COMPTON WORKS · ASHBOURNE — Phone 113 — DERBYSHIRE

Rockets and Guided Missiles

By

JOHN HUMPHRIES

INTENDED in the main for engineers and technicians, this complete survey of present-day achievements and possible future developments presents the latest information on rocket motors and their applications from an engineer's point of view. Both solid and liquid propellant motors are discussed, the latter more fully as being of greater interest to the engineer. The first half of the book covers propellants, motors and components, the second, the applications of these motors to missiles and aircraft, and in conclusion a review of potentialities for the future is appended. The author has had wide practical experience following a brilliant scholastic career, and is at present actively engaged on rocket research.

31*s.* (*postage paid*)

Ernest Benn Limited

Bouverie House · Fleet Street · London · EC4

PETROLEUM-DERIVED AROMATIC SOLVENTS AND HYDROCARBON RESINS

SOLVENT AR-395

Boiling range	212-272°C.
Aromaticity	98% by volume

OTHER CUTS AVAILABLE ON REQUEST, INCLUDING BOILING RANGES 177-211°C. & 232-285°C.

PETROLEUM-DERIVED HYDROCARBON RESINS

of high light stability and compatibility with other synthetic resins.

Softening point about 100°C. ASTM method.

ODOURLESS ALIPHATIC SOLVENT

thinner for odourless paints.

Boiling range about 175-210°C.

OTHER PRODUCTS CURRENTLY HANDLED IN BULK AND DRUMS INCLUDE:

N-BUTANOL · ISO-BUTANOL · BUTYL ACETATE · 2-ETHYL—4-METHYL PENTANOL · ETHYLENE GLYCOL

Enquiries to:

CHEMITRADE LTD., 17 STRATTON STREET, LONDON, W.1.

Telephone: GROsvenor 3422. **Cables: Multikem, London.**

Telex: London 28694 Traforchem

CHEMICAL UNLOADING SIMPLIFIED

***Powders Collected, Conveyed Filtered and Reloaded in* ONE OPERATION . . .**

Diagrammatic representation of unloading of a chemical Still by 7½ h.p. "CLEARFLO" SUCTION AND SEPARATION PLANT and direct filling of 40-gallon drums. This is typical of the many ways in which CLEARFLO Equipment can be used in modern chemical processes.

Your enquiries are invited

(On right) 15 h.p. Standard CLEARFLO Pneumatic Conveying Unit.

BIVAC AIR COMPANY LTD

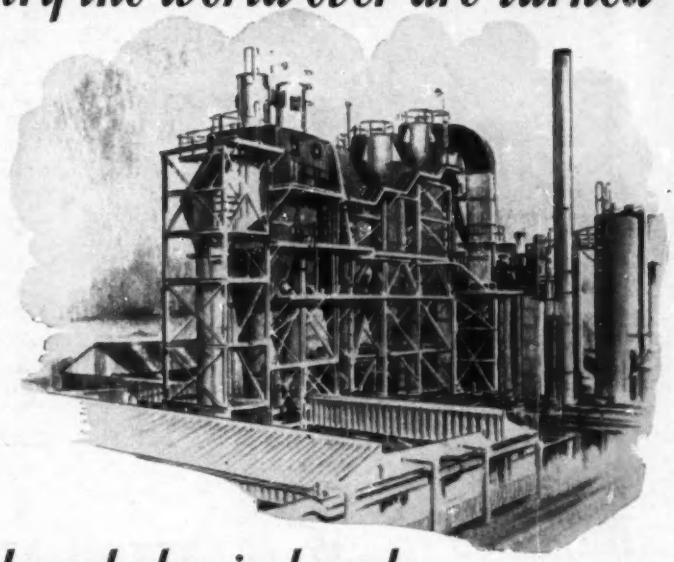
PORTWOOD, STOCKPORT, CHES. *Tel: STOckport 3468/9*

Wheels of industry the world over are turned

by

B T-H

ELECTRIC MOTORS



in the paint, varnish and chemical works

Whenever a power drive is needed, there is a BTH motor that will do the job efficiently and economically. In industries all over the world, BTH motors are helping to increase production. Over half-a-century's experience of this branch of electrical engineering enables BTH to offer the motor with the mounting, enclosure, rating and performance best suited to the application.

BTH factories are exceptionally well equipped to make both ***STANDARD*** *and* ***SPECIAL*** *machines in large quantities.*

Member of the AEI group of companies

THE
BRITISH THOMSON-HOUSTON
COMPANY LIMITED, RUGBY, ENGLAND

A4691

Printed in England by Staples Printers Limited at their Bayswater, London, establishment, and published by Benn Brothers Ltd., at Bouverie House, 154 Fleet Street, E.C.4. Registered at the General Post Office. Entered as Second Class Matter at the New York, U.S.A., Post Office.